

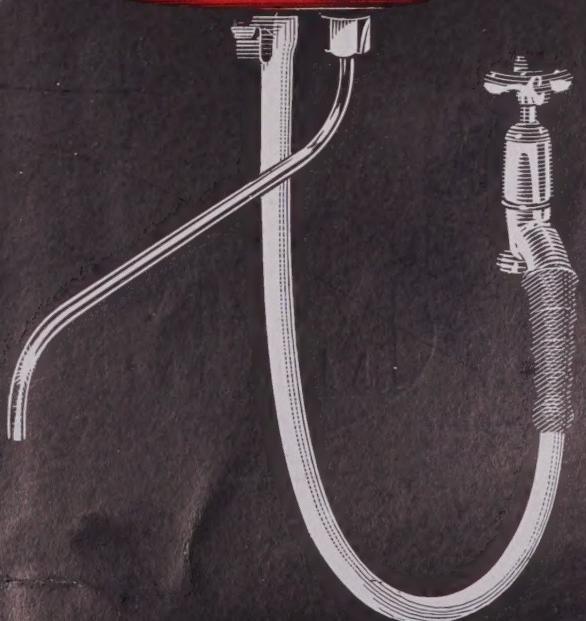
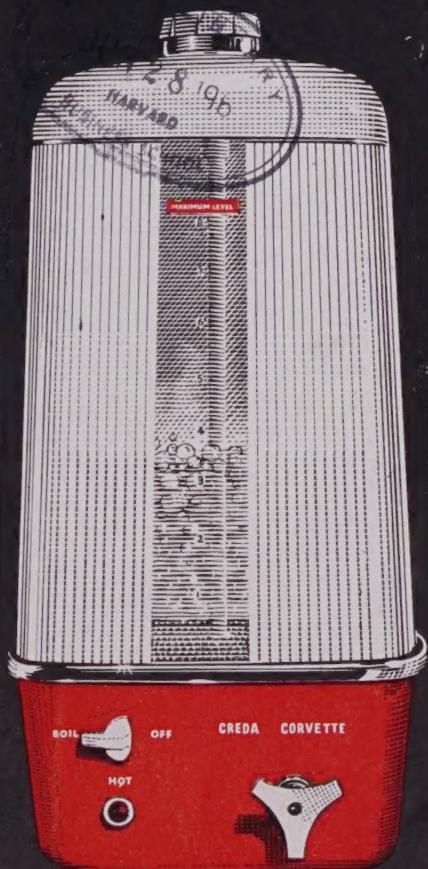
ELECTRICAL REVIEW

FRIDAY
10 JUNE 1960

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The NEW range of— “MEMREX-EXEL” 500 volt Switchgear

**PRESSED STEEL ENCLOSURES
FOR LIGHTNESS AND STRENGTH.
FRONT OPERATING SWITCH HANDLES.
REWIRABLE OR H.R.C.
10—15—30 Amp. Switches
10—15—30—60 Amp. Switchfuses.**

This new range of “Memrex-Exel” switchgear provides the most up-to-date and technically advanced range of 500 volt industrial switchgear yet offered to industry.

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Features include

Cases of one piece pressed steel with hinged covers, rustproofed and finished light grey stove enamel.

Front operating switch handles improve appearance and permit more compact assemblies on switchboard and panels.

Fuses are of the new “Kantark-Exel” pattern which will accept rewirable or H.R.C. fuses. Semi-enclosed rewirable (damper type) patterns comply with B.S.3036 : 1958.

H.R.C. cartridge patterns which are interchangeable with semi-enclosed rewirable patterns, comply with B.S.88:1952, Appendix ‘J’ Dimensions.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88 : 1952, Appendix ‘J’ Dimensions, Form A—Offset Tags.

M.E.M. H.R.C. cartridge fuse-links are available for use with this range of switchgear. All ratings have been A.S.T.A. certified for Categories of Duty 440 A.C.3 (16,500 amps), 440 A.C.4 (33,000 amps.) and 440 A.C.5 (46,000 amps.).



“Memrex-Exel” switches comply with the relevant Temperature Rise and Making and Breaking Capacity Tests of B.S.861: 1955 and B.S.2510: 1954.

All these and many other features.

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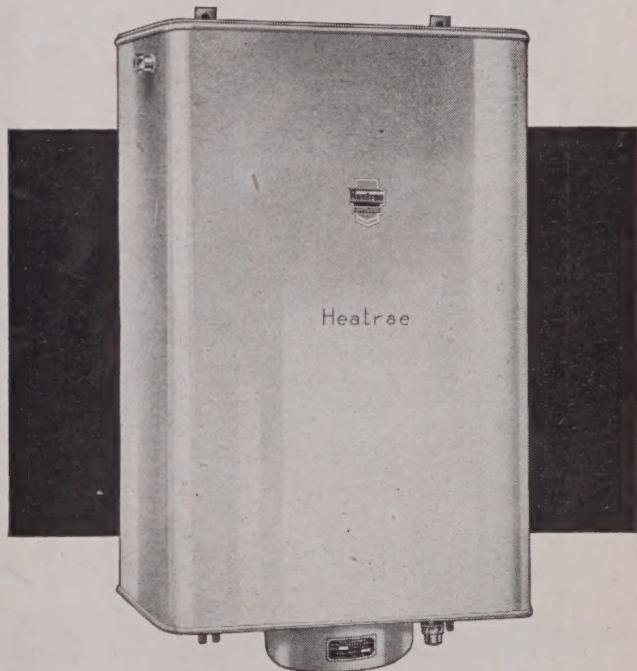
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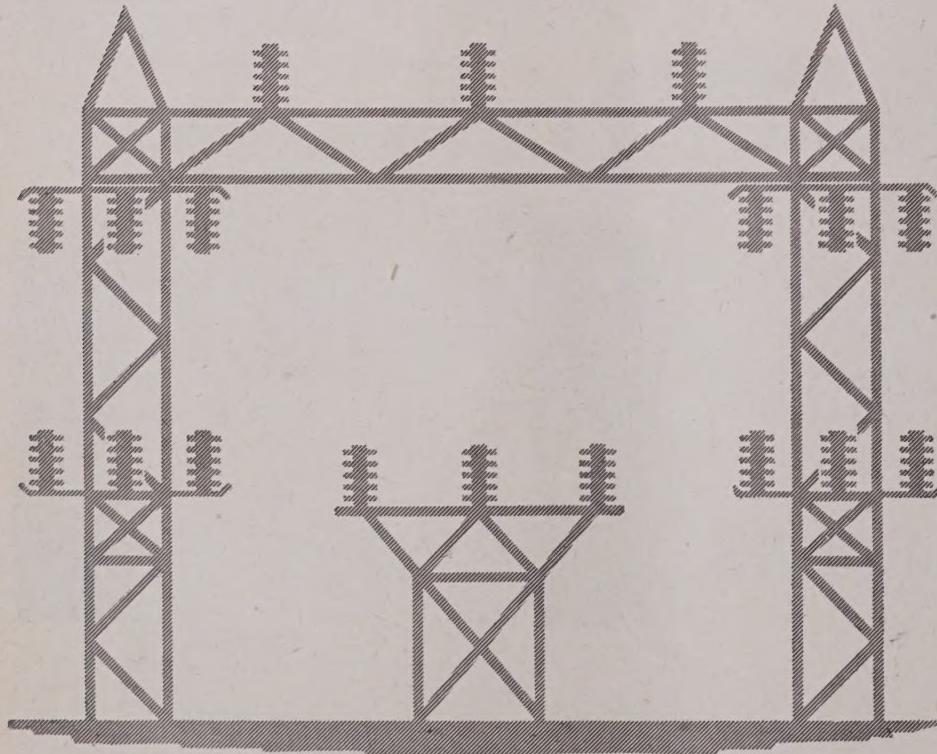
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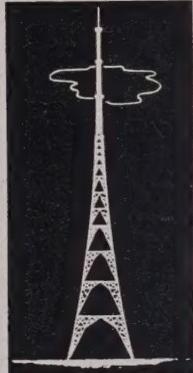
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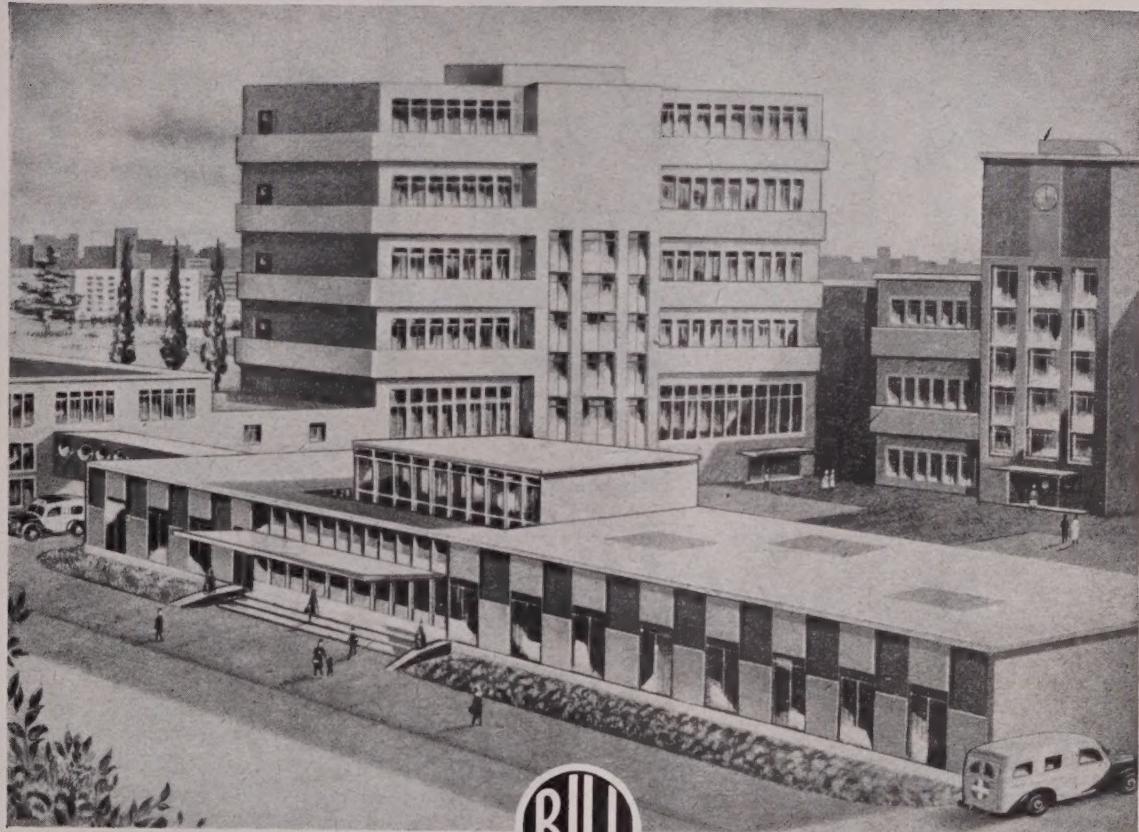
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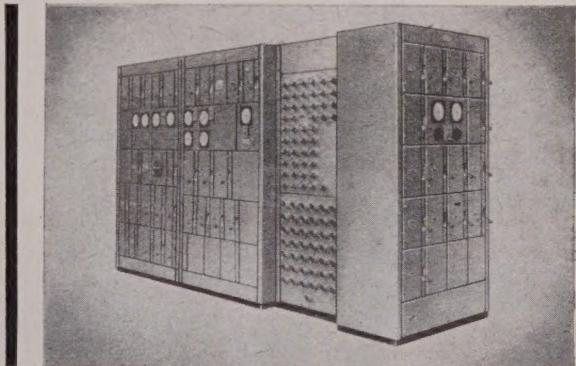
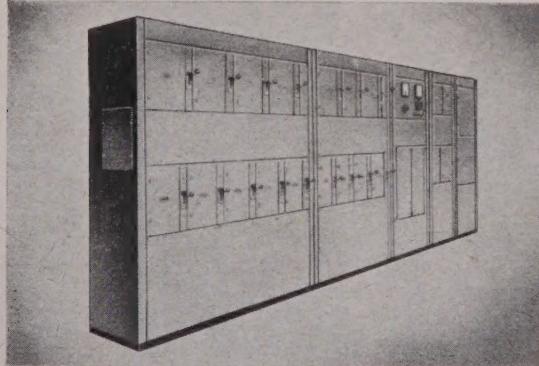
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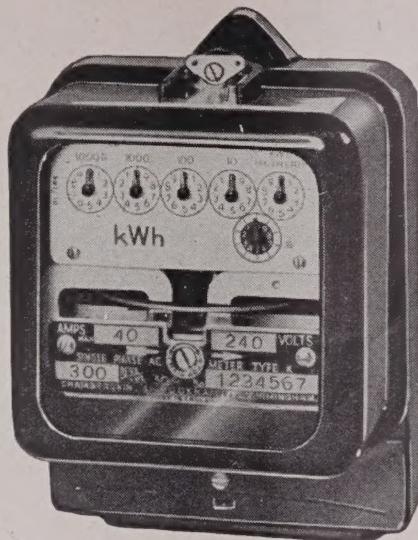
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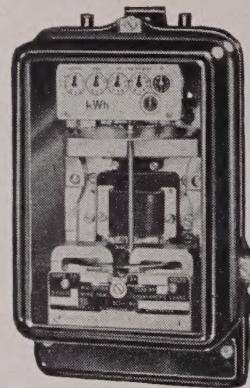
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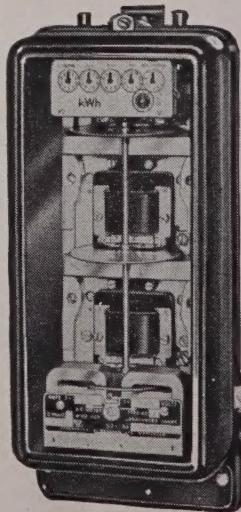
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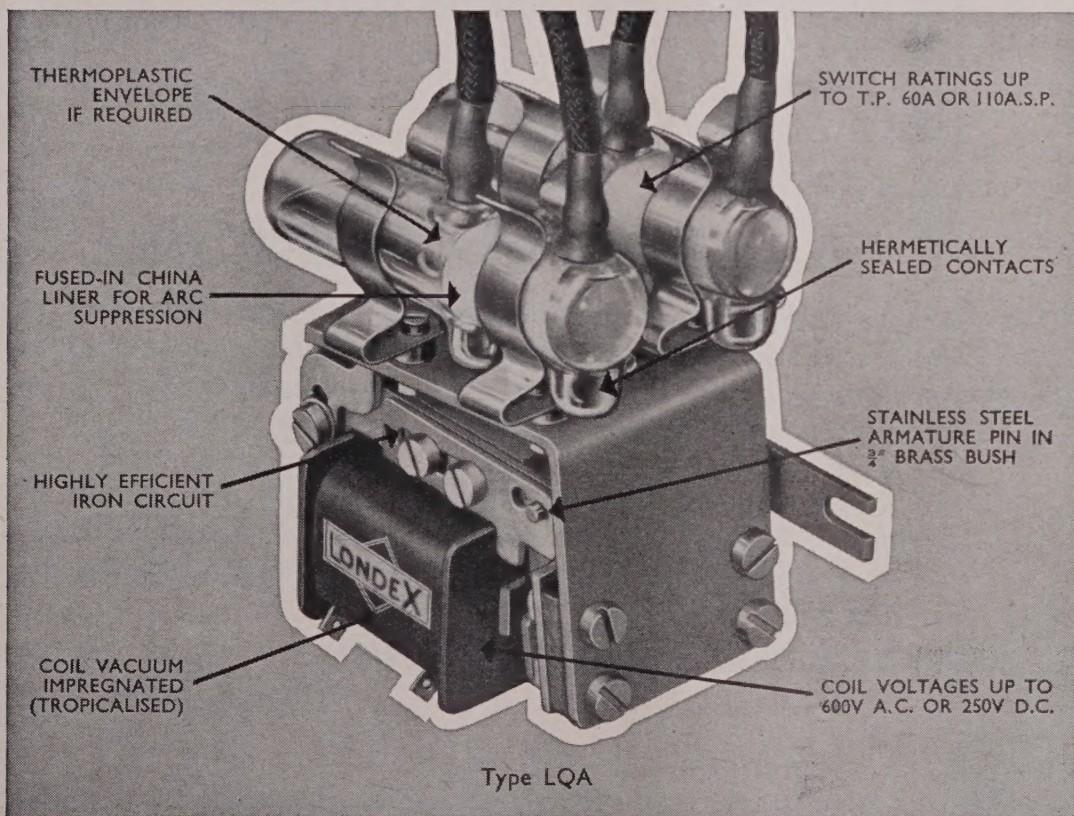
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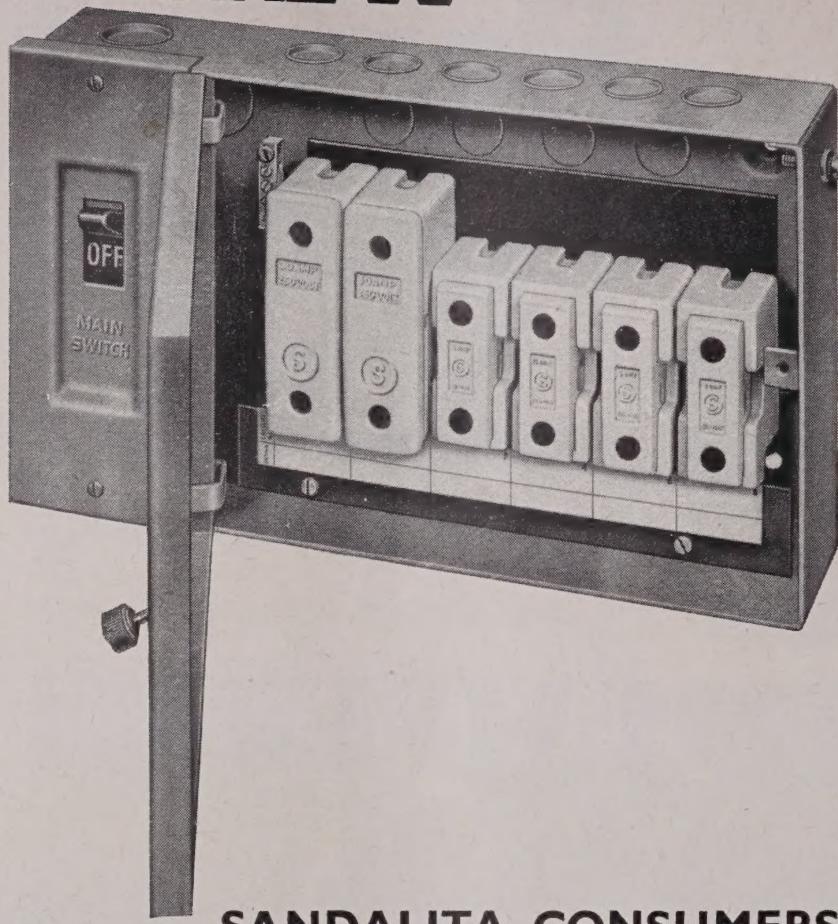
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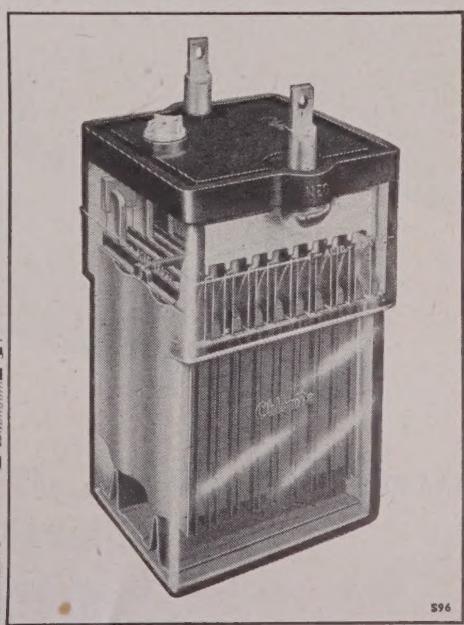
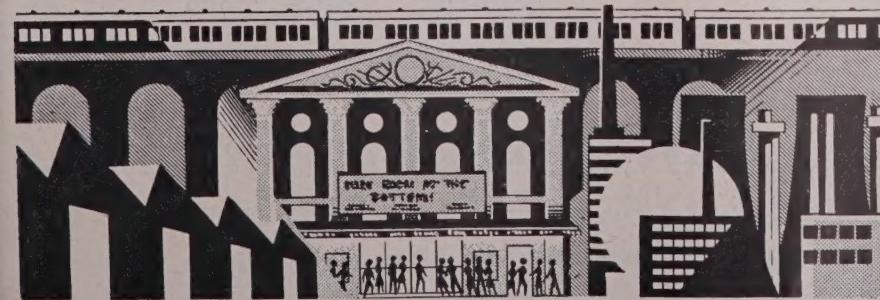
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*The new cell will from now onwards be fitted in all Keepalite units—the Chloride Company's automatic emergency lighting system.

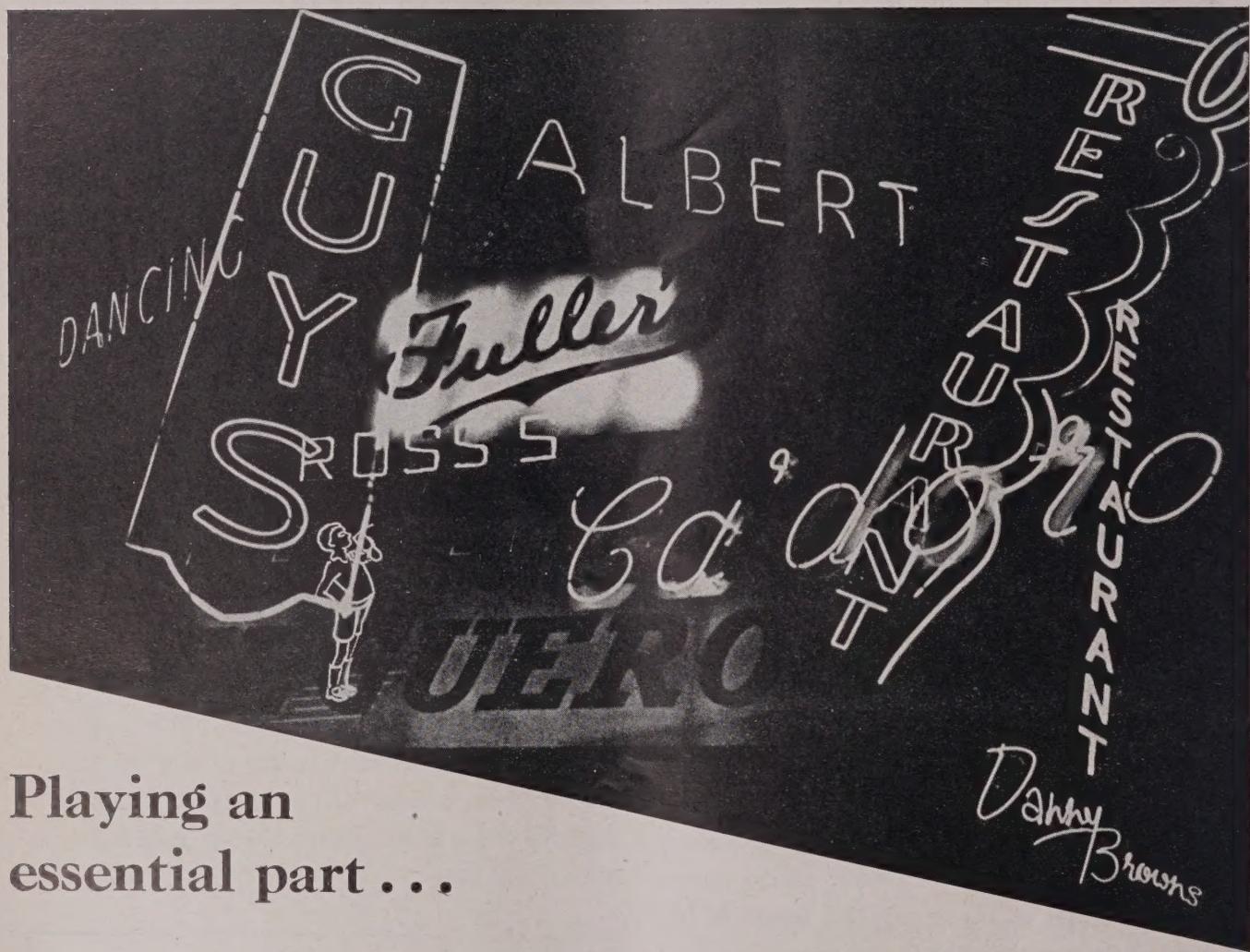
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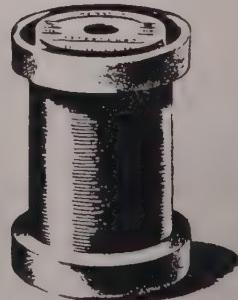
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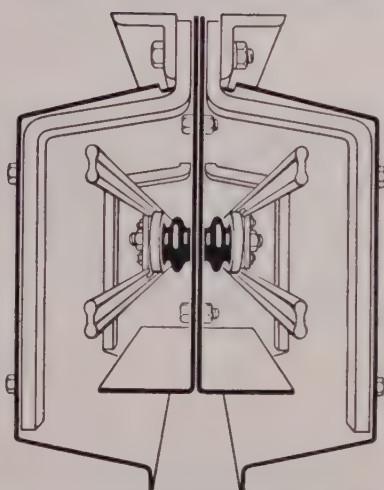


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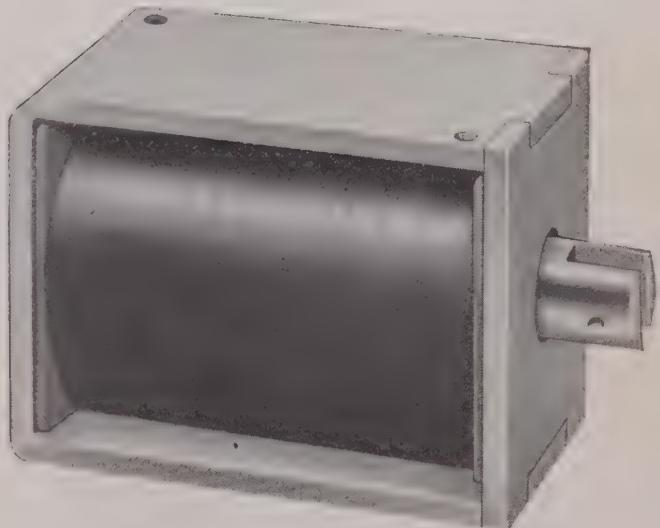
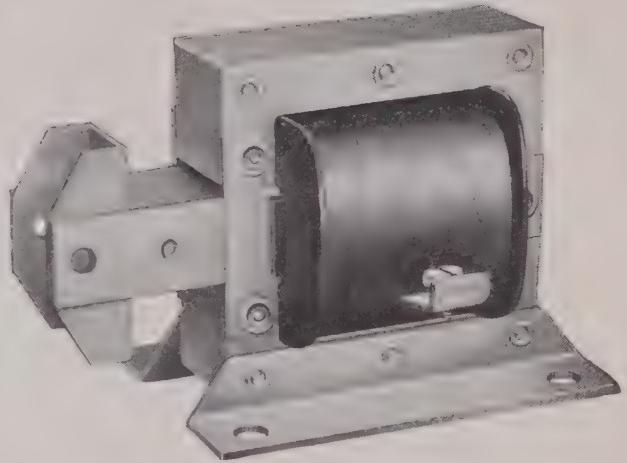
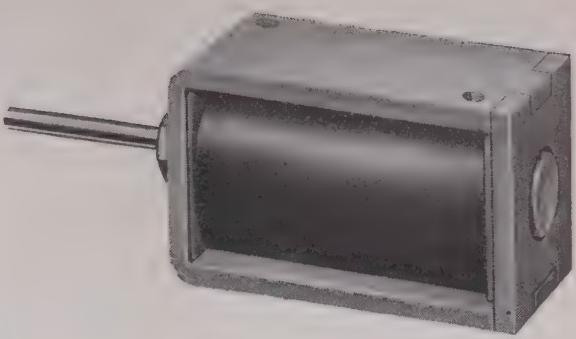
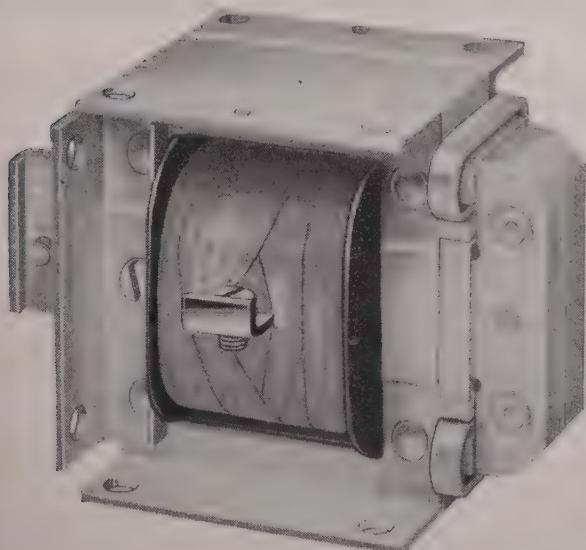
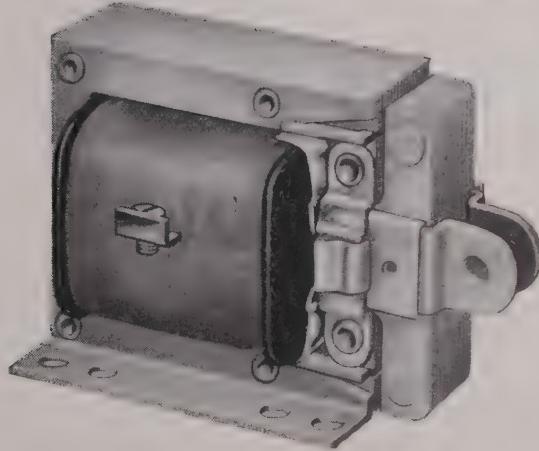
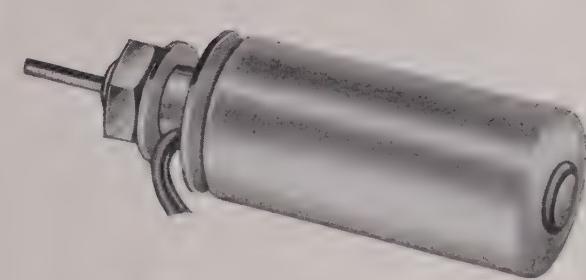
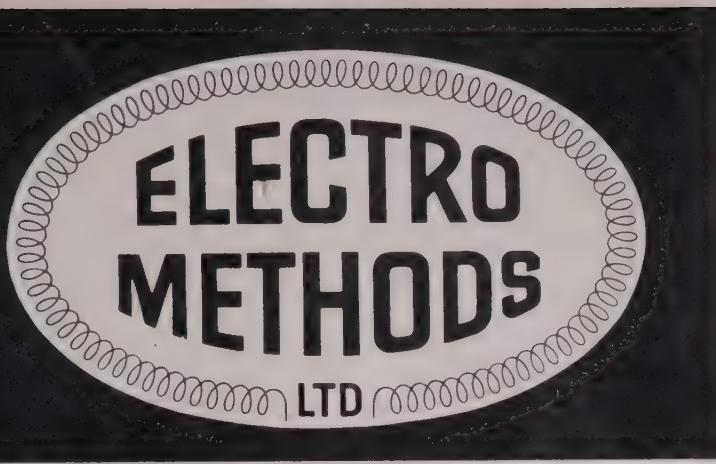
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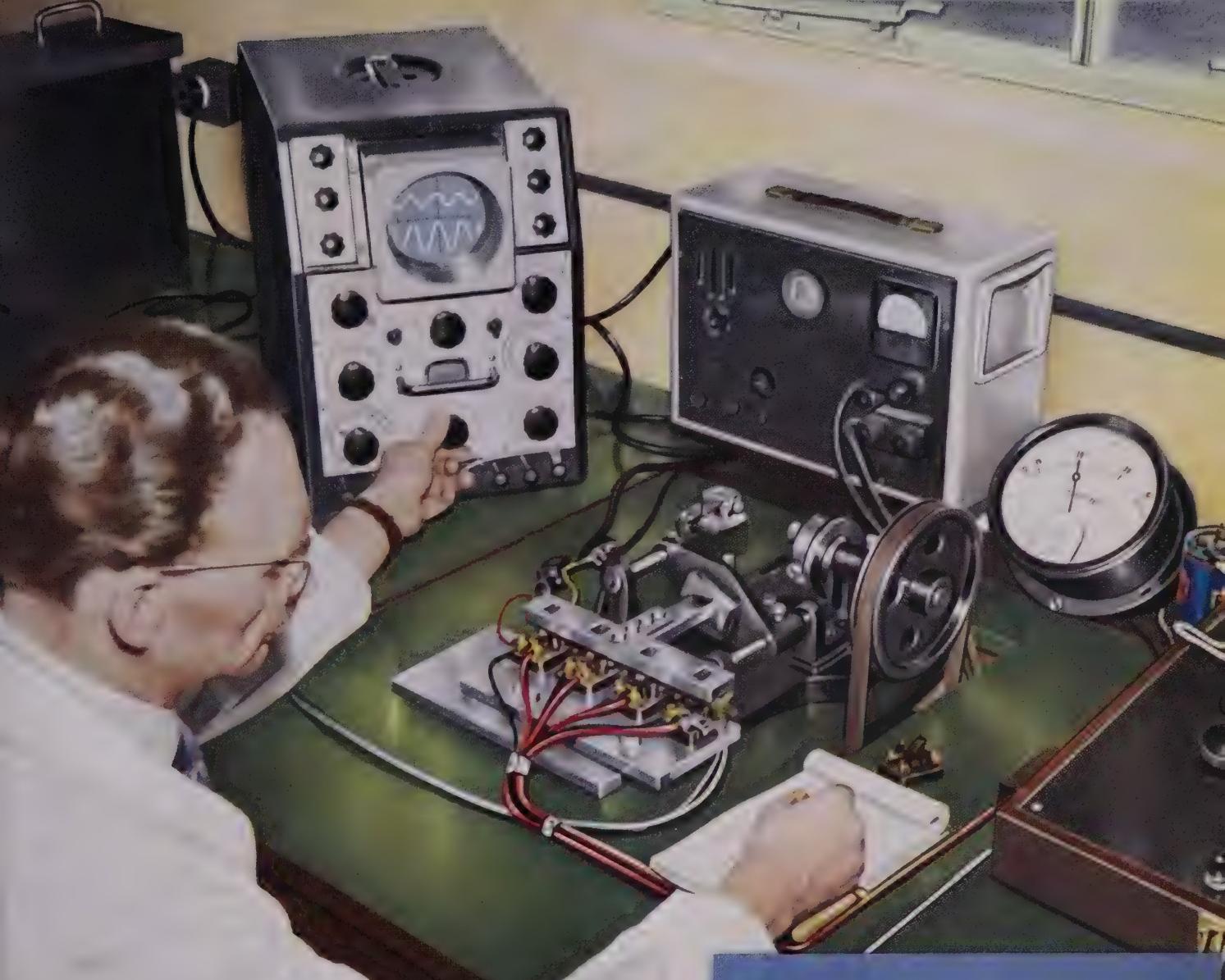


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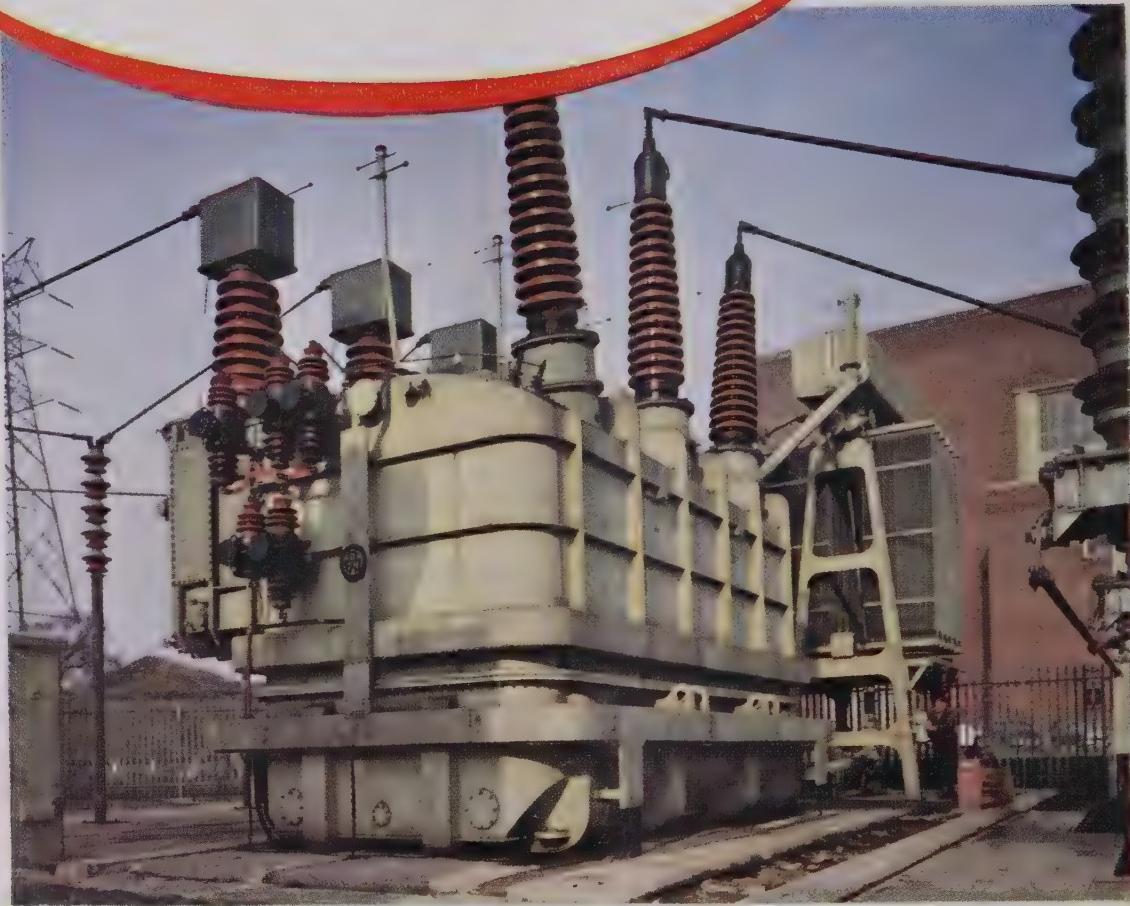


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Enfield-Standard
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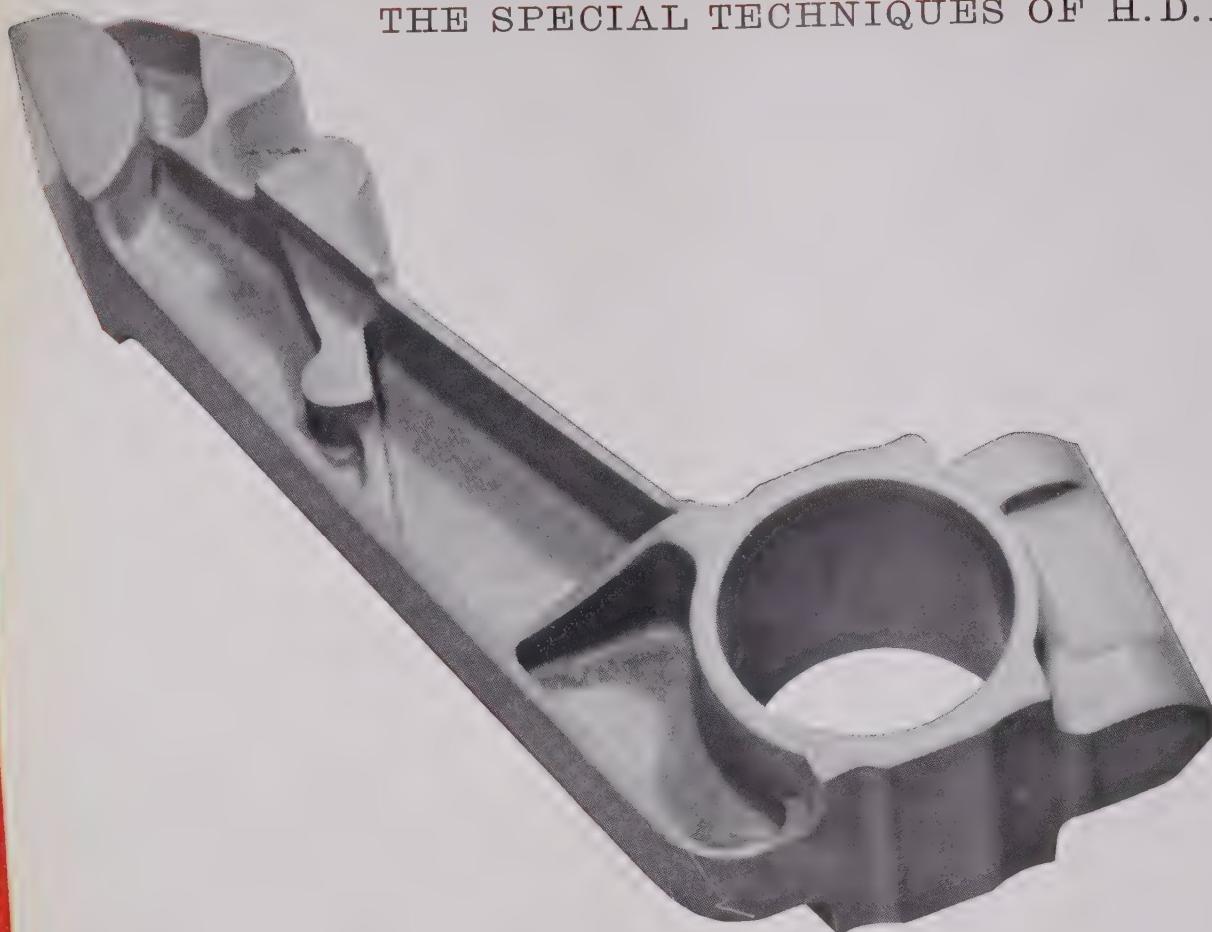


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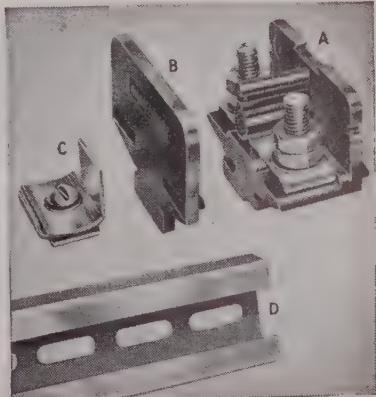
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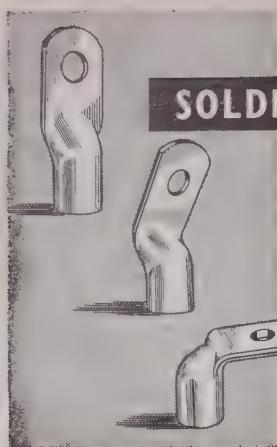
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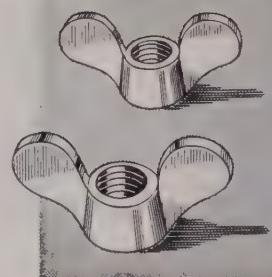
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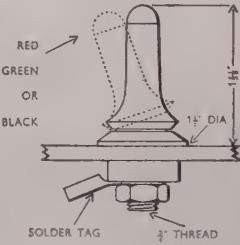
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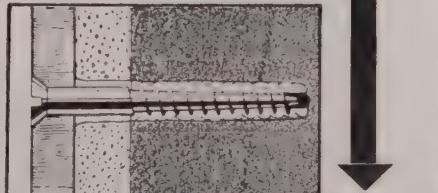
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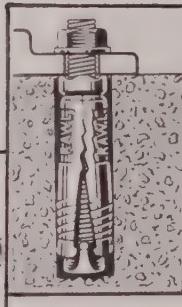
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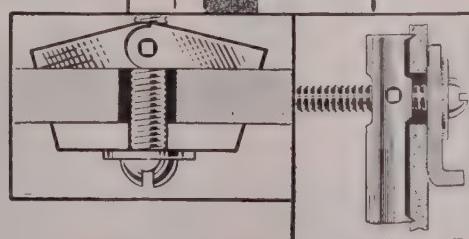
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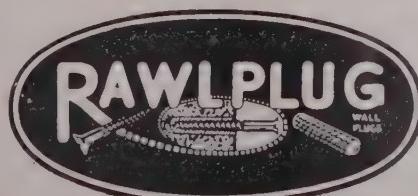
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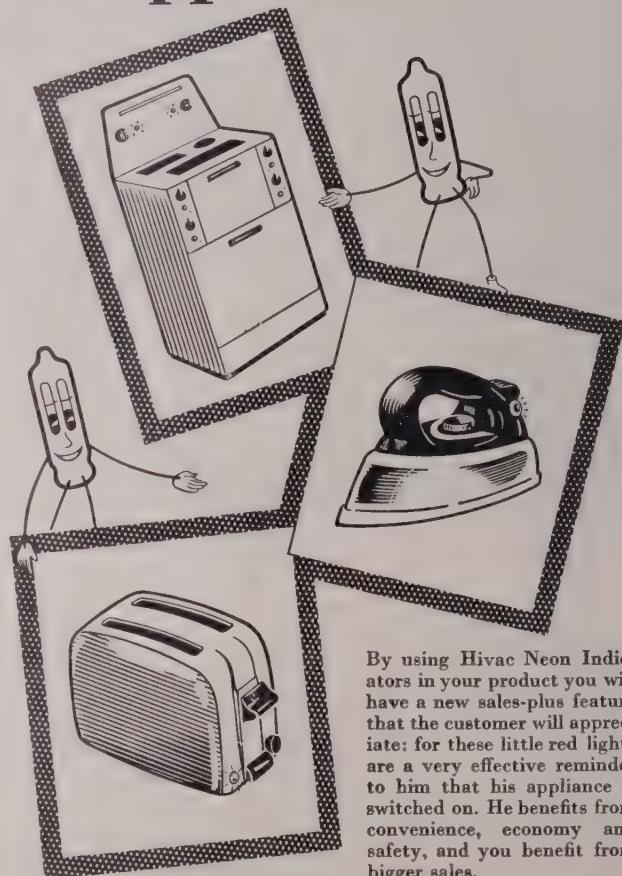
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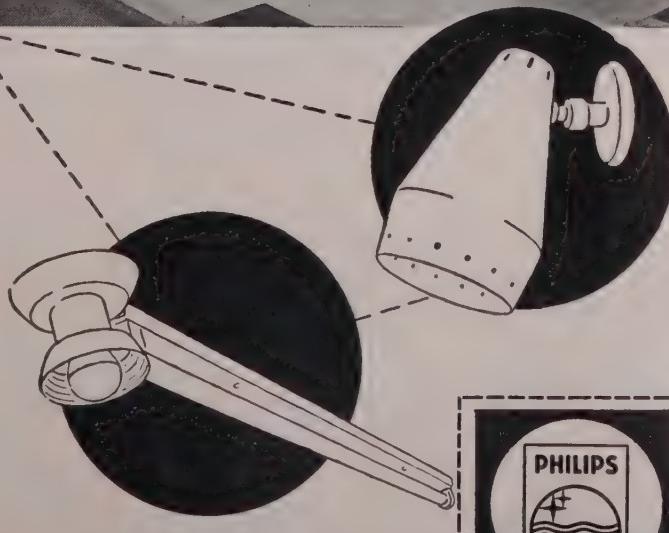


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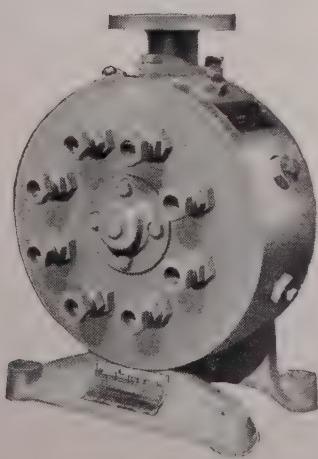
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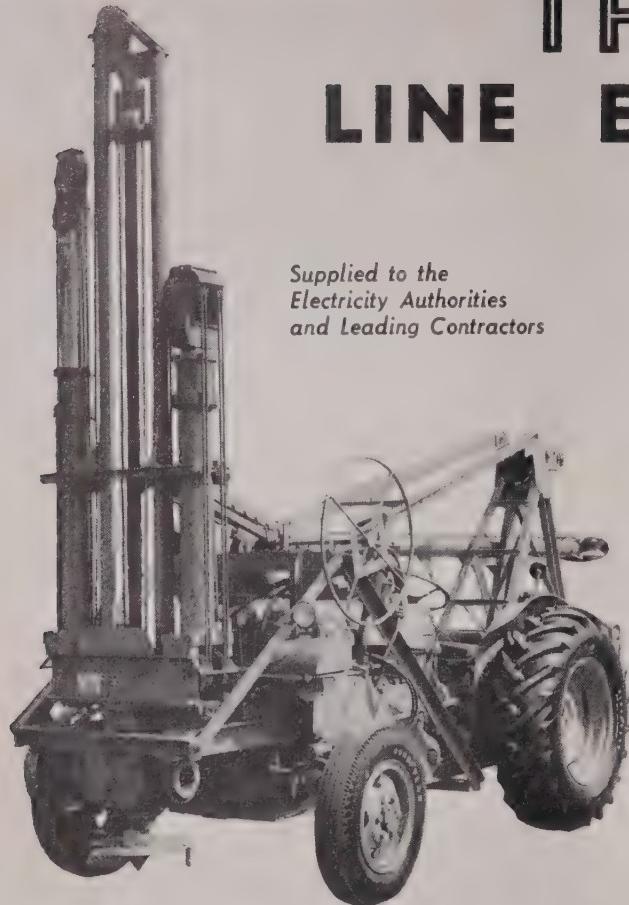
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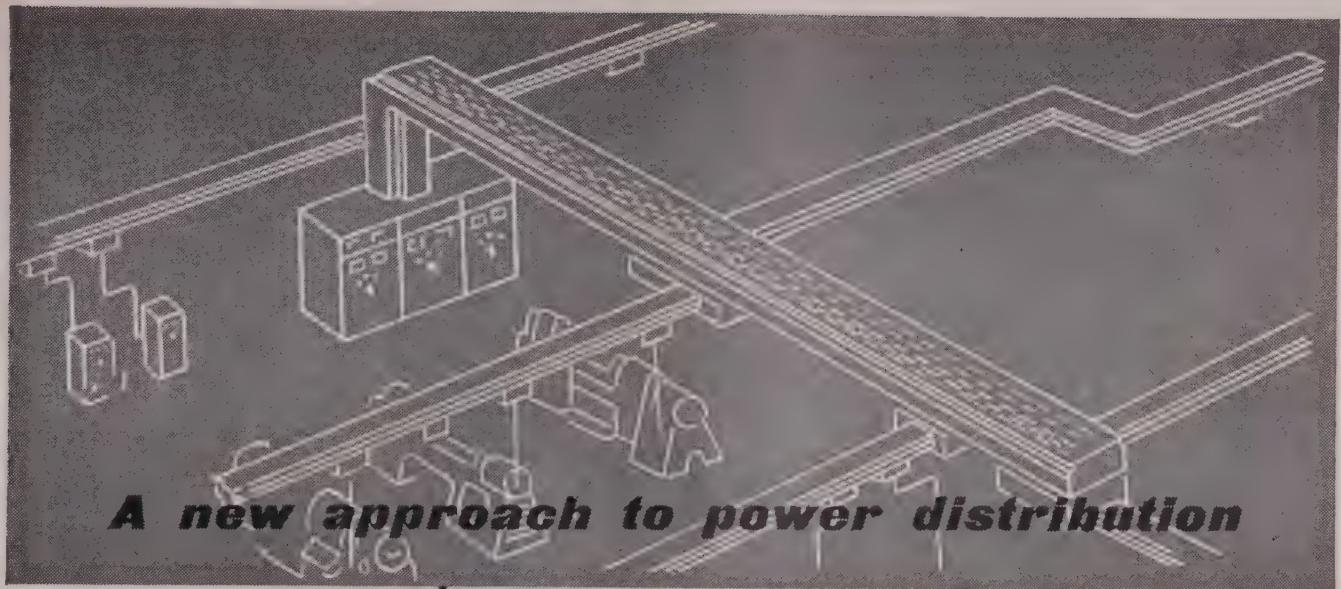


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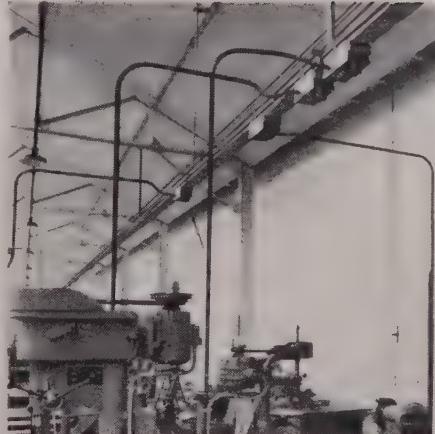
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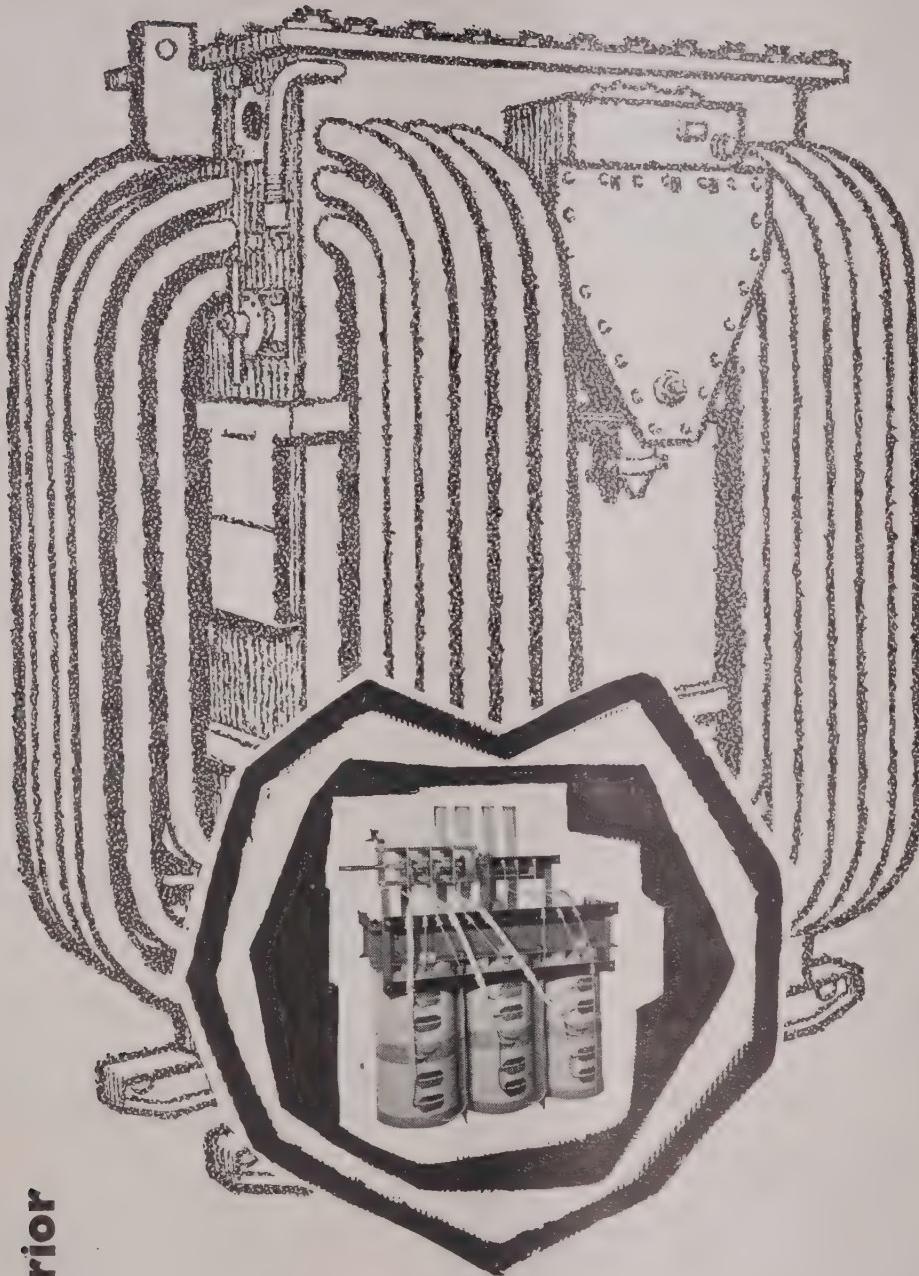
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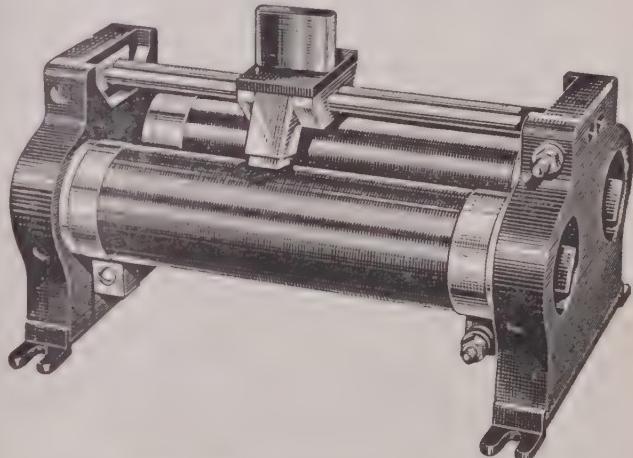
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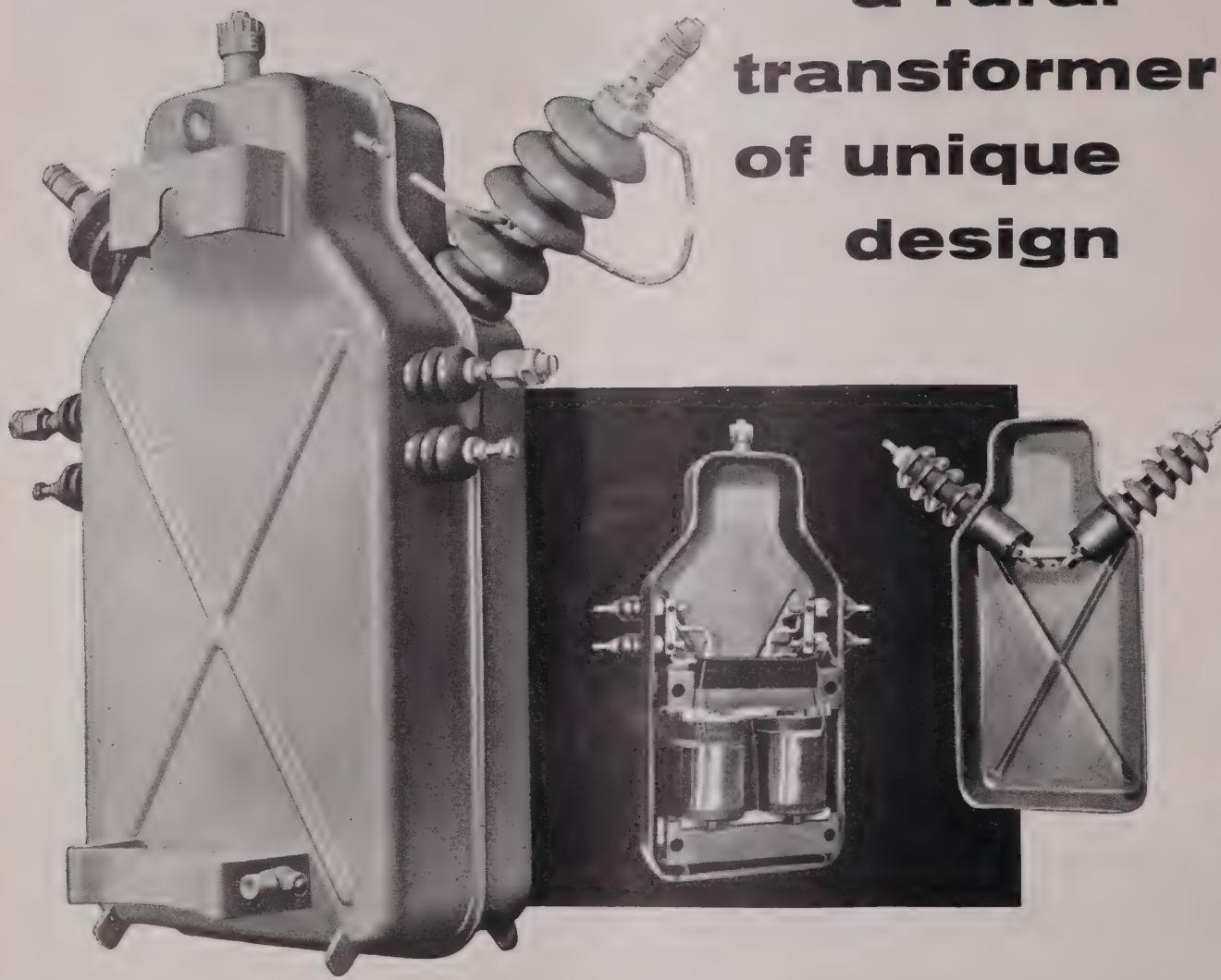
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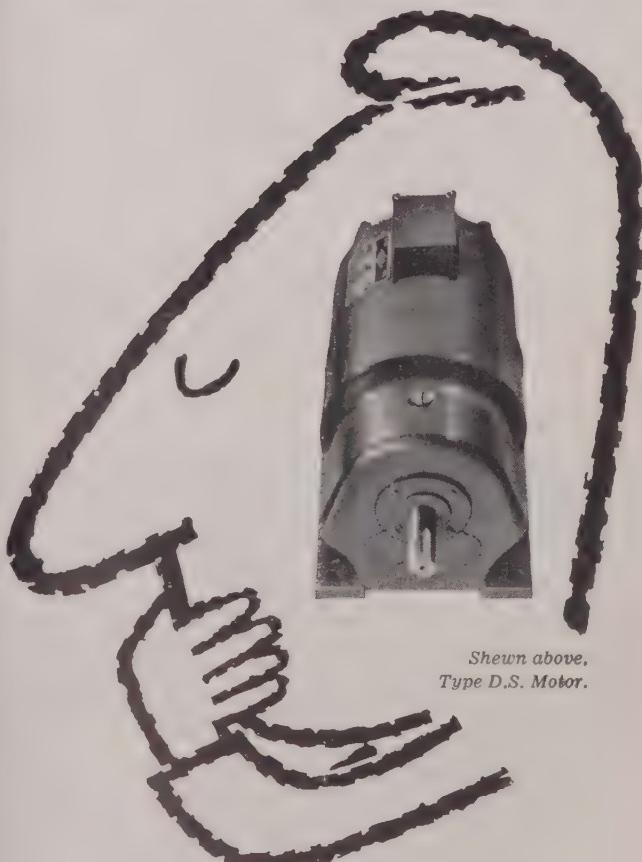
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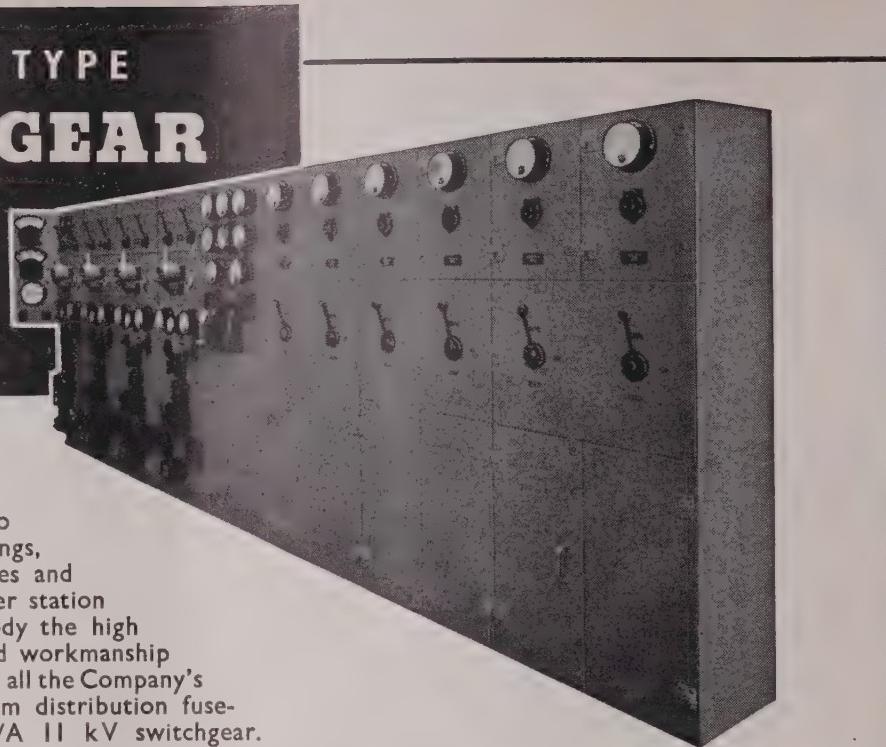


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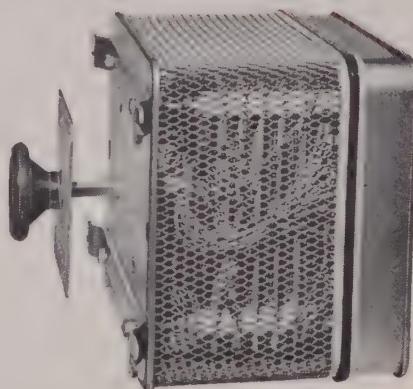
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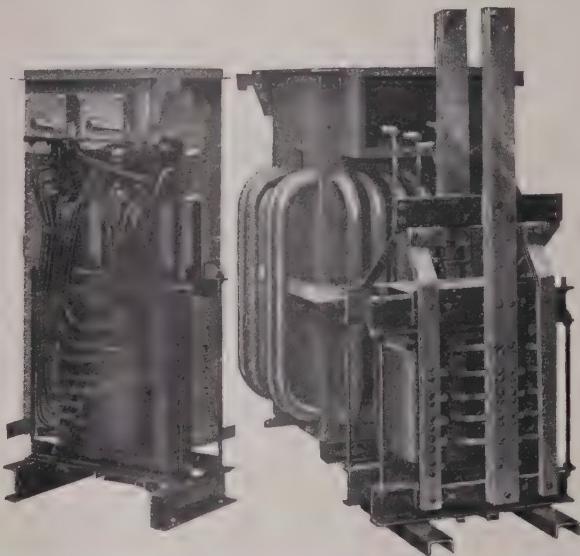
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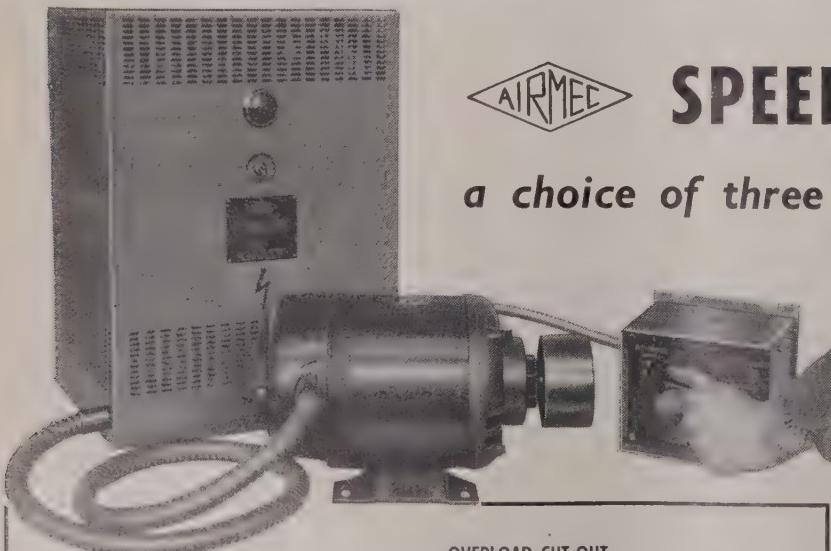
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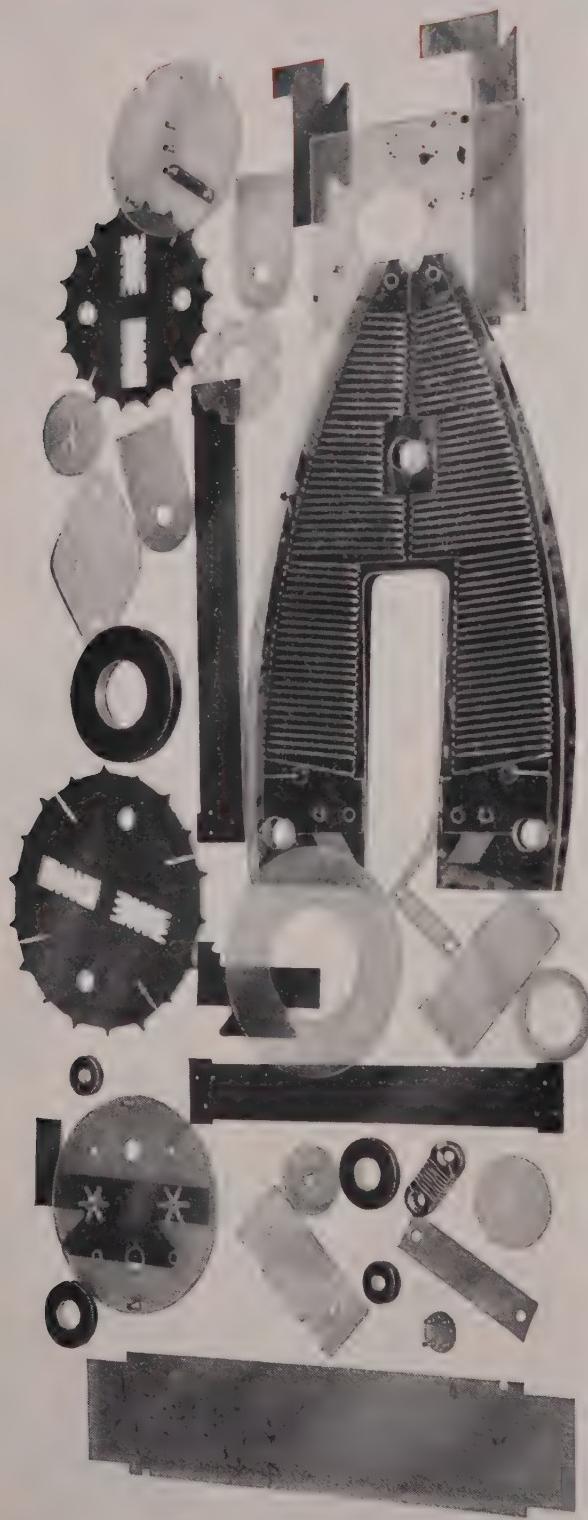
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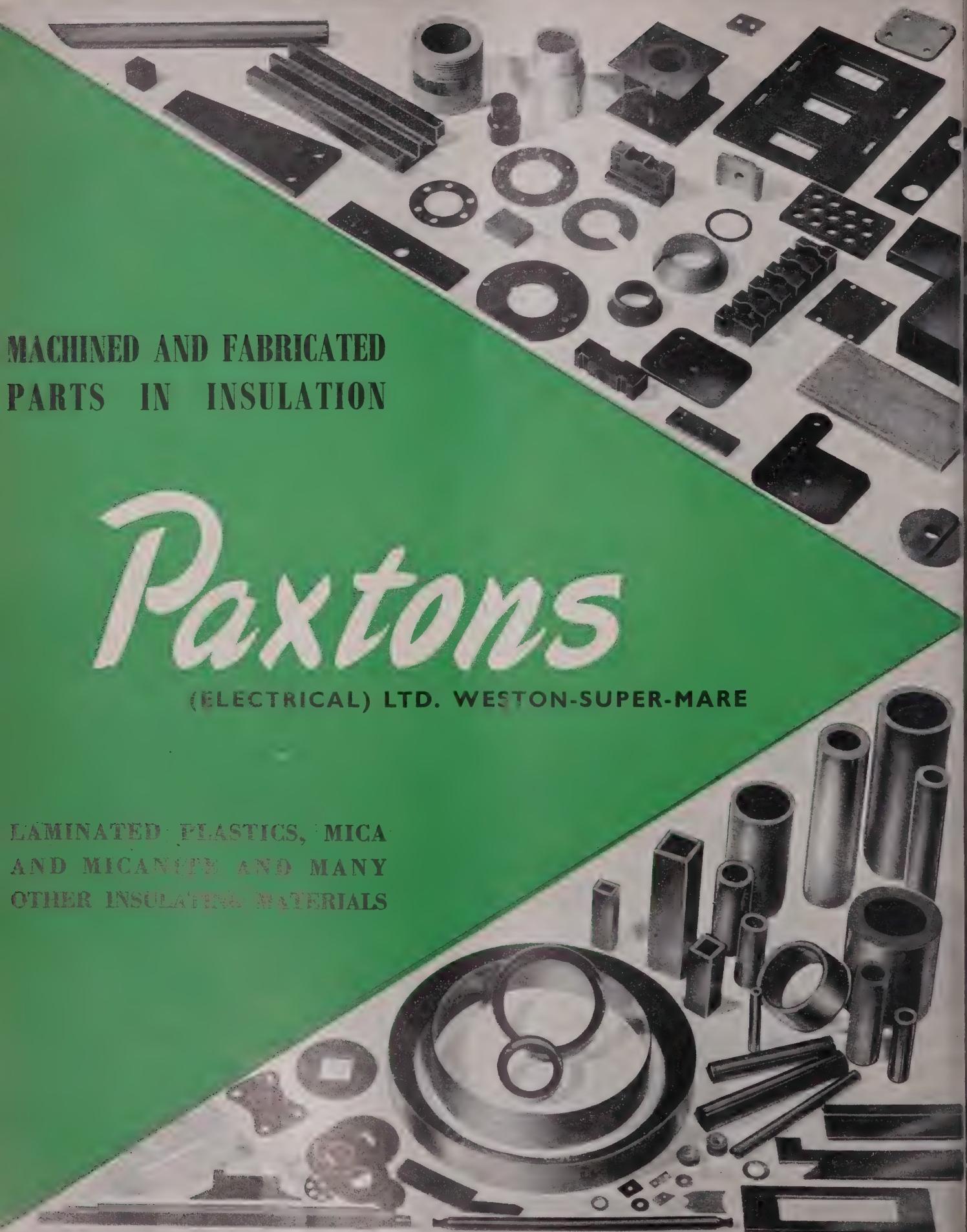
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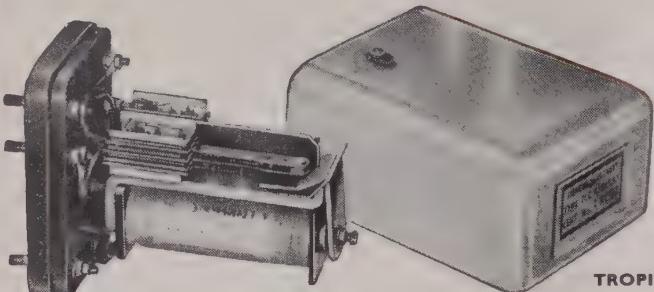
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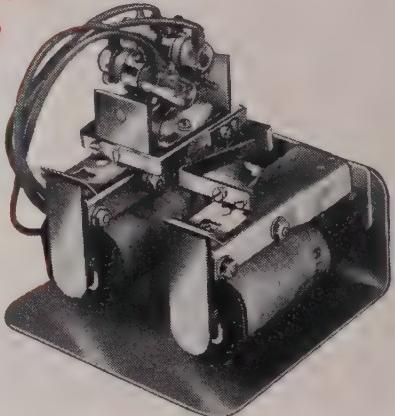
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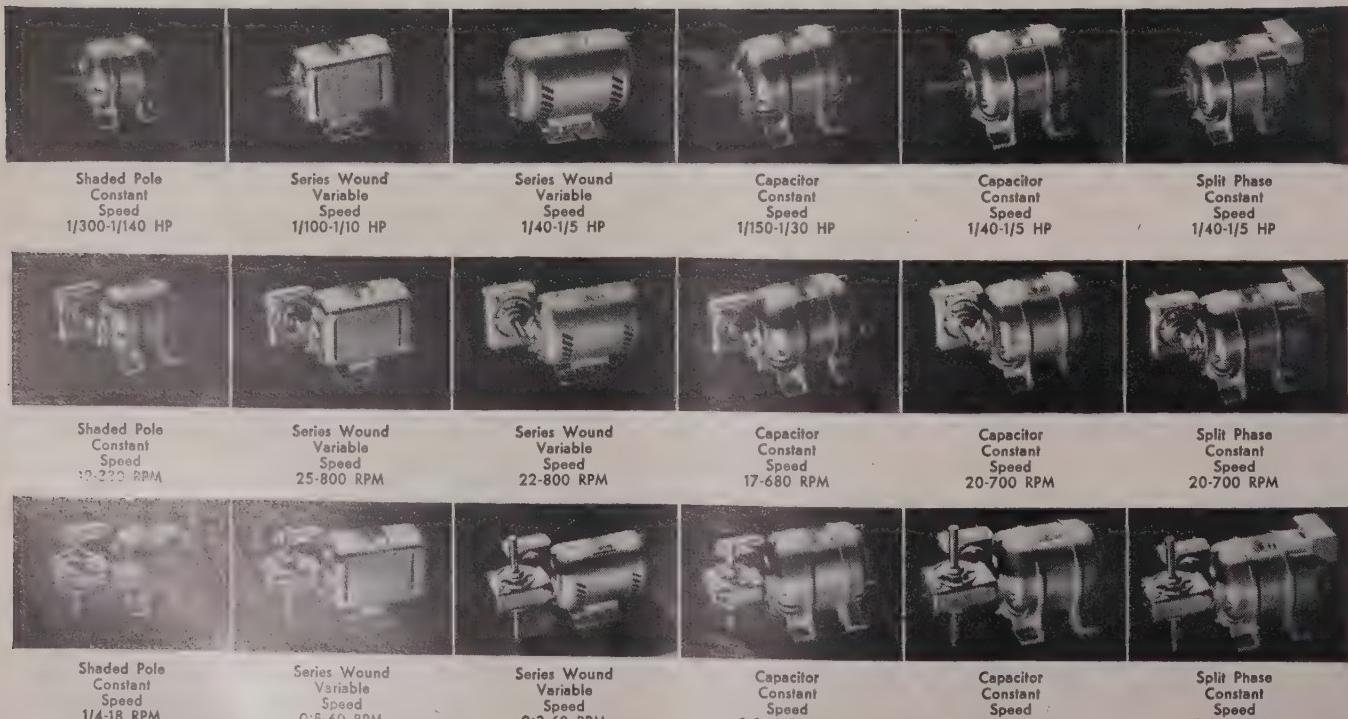
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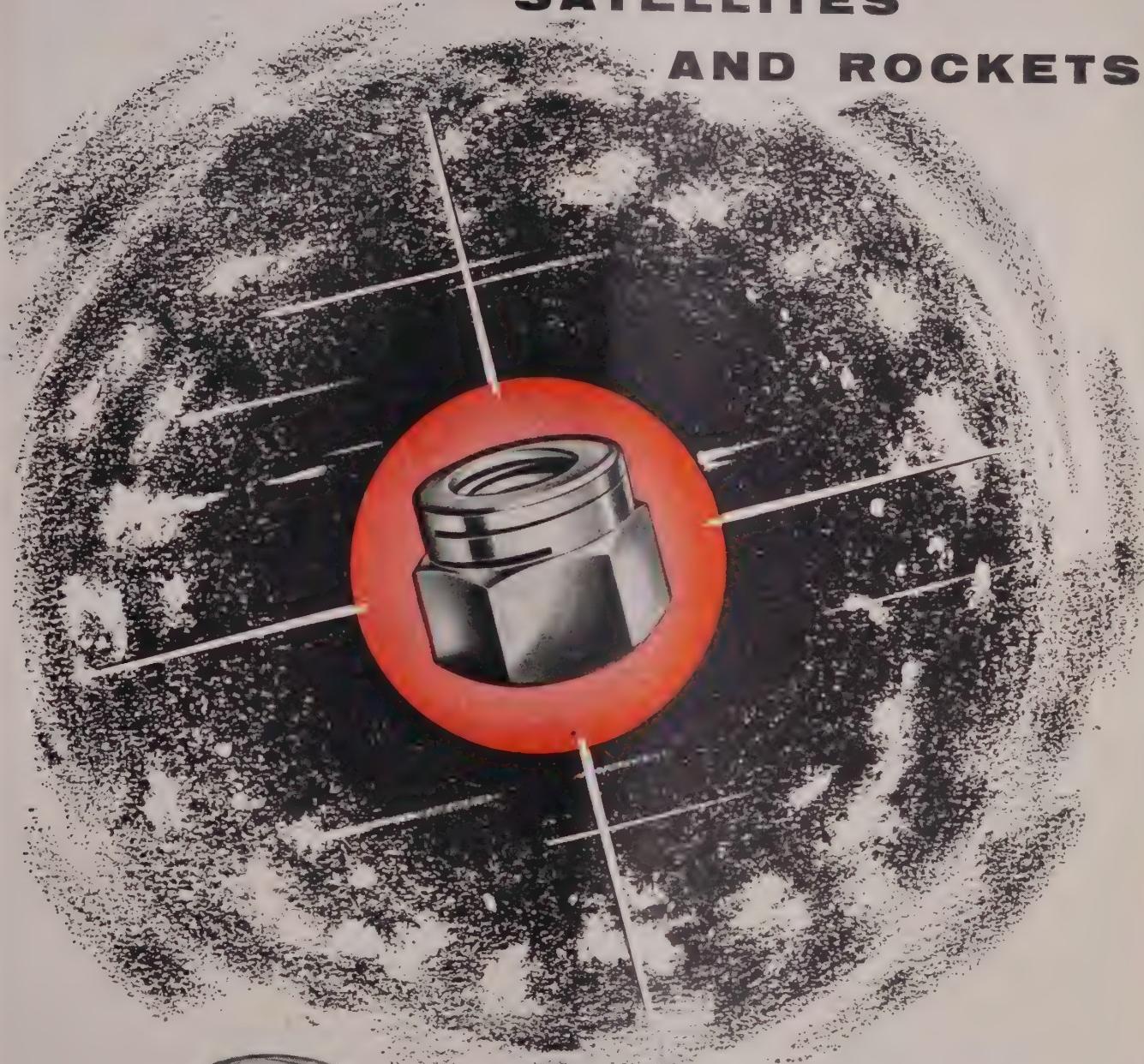
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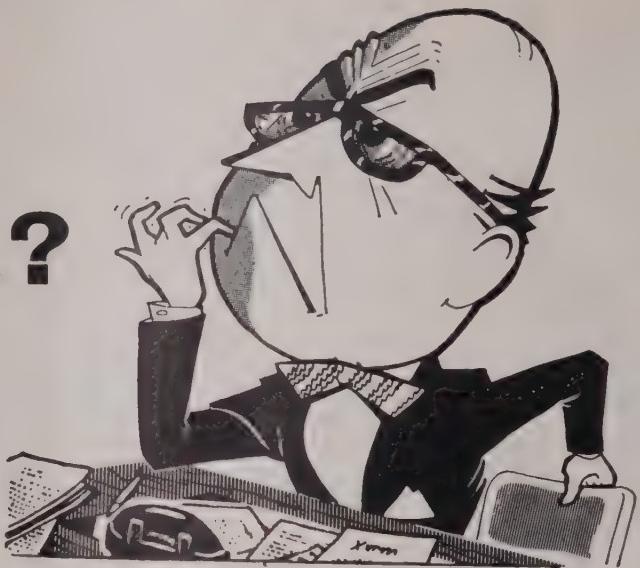
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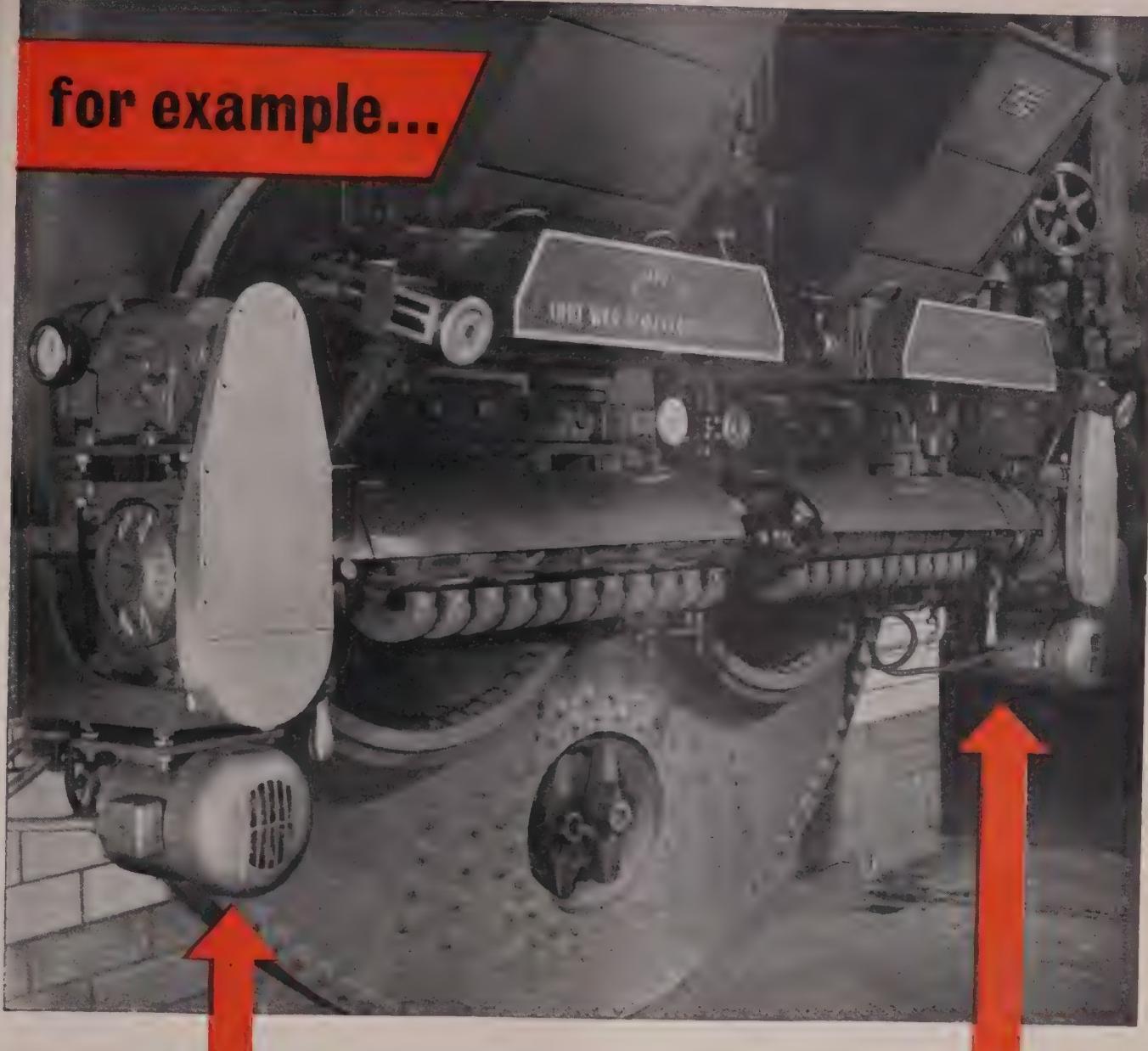
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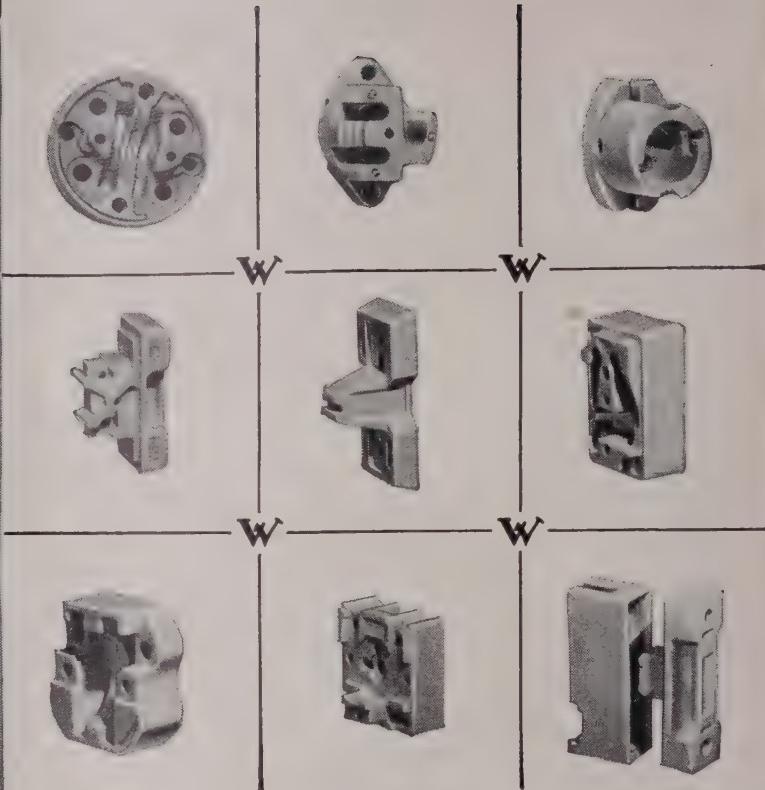
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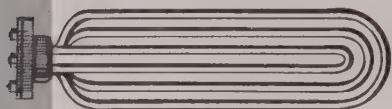
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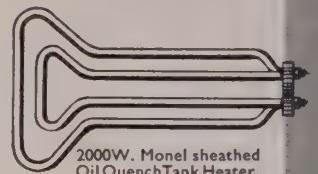
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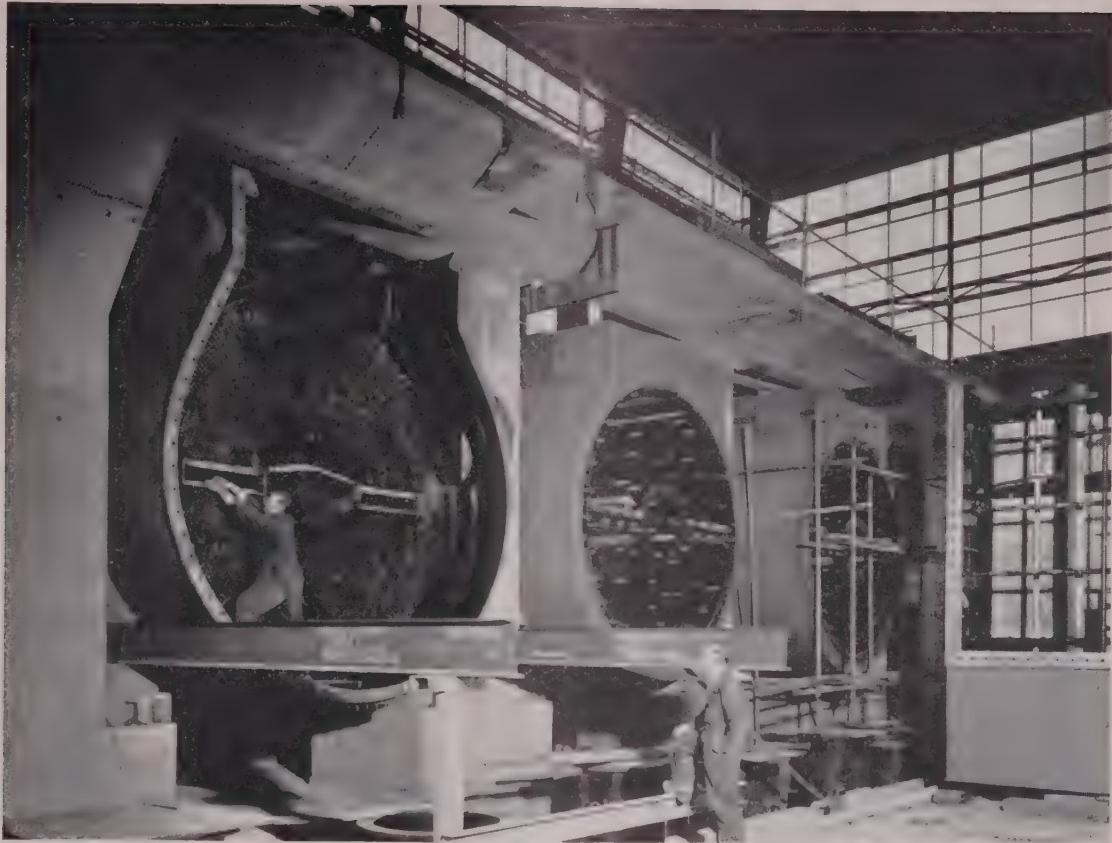
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A view of one of four triple shell condensers being installed with A.E.I. turbine generators at Berkeley Power Station.

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A. R. POLLARD, A.M.I.E.E.

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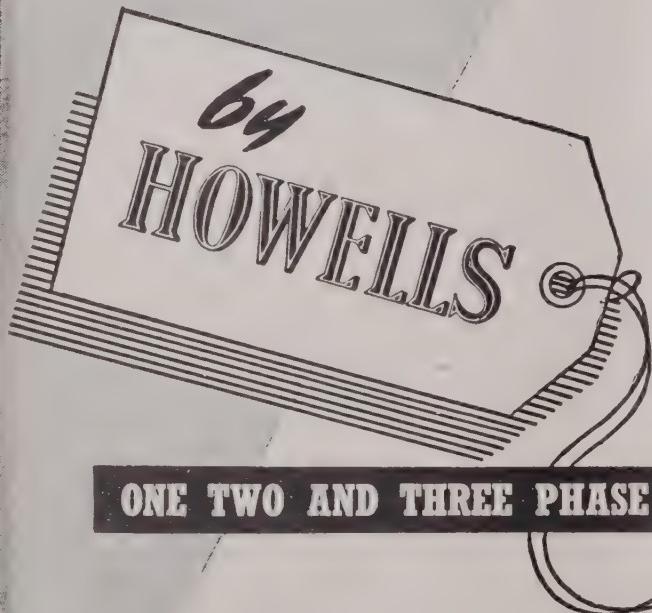
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Forecasting Future Demand

FOR how long can the consumption of electricity be expected to continue expanding at its present rate? A doubling of demand every ten years has come to be considered as axiomatic. But in longer-term forecasts it now appears customary to allow by formula or empirical judgment for a slowing down in the rate of growth of demand. Whether this is the result of a considered consensus of opinion or merely the reflection of the same element of caution that tends to enter into medium-term forecasts is not clear. Yet it is important that there should be reasonably accurate predictions of the probable future course of demand not only to enable physical needs to be catered for but also because of the psychological effect on the outlook of engineers and others in the industry.

As is pointed out in the Economic Commission for Europe's latest annual report on electricity supply,* there has in the past fifteen years been a tendency to underestimate the rate at which the consumption of electricity has increased. It may be argued that the post-war period has been of exceptional economic development and is not therefore a good guide for the future. Against this it is possible to point to the extraordinary resilience which the demand for electricity showed in the slight recession of 1957/58.

An important element in this resilience of demand has been the increase in industrial electrification and the spectacular rise in household and other low voltage consumption. The chemical and metal manufacturing industries have also revealed a capacity for sustained growth over a long period. Again electricity supply does not appear to have been adversely affected by the important structural changes in the pattern of Europe's primary energy requirements. Even allowing for the different conditions, the continuing expansion in countries where consumption per head is already very high, indicates that an optimistic view should be taken of the potential for growth in this country.

The development of the electricity supply industry is not merely a reflection of the requirements of its consumers. The industry can through its policies and by attention to utilisation research exert quite a strong influence on the rate and direction of the future expansion in demand. The effect of external economic factors is more difficult to gauge. Yet

* *The Electric Power Situation in Europe 1958/59 and its Future Prospects.* (H.M. Stationery Office, price 5s.)

despite the differences in natural resources, industrial pattern, population growth and other influences, the part played by electricity in economic progress, and its relationship to total national output, productivity, and use of energy, are following similar and upward trends in all European countries. As a result, the comparatively smoothly rising long-term trend in consumption per unit of national product shown by virtually all countries has been suggested by the E.C.E. as a useful index for forecasting purposes. The maintenance of full employment and high purchasing power, to which will increasingly be linked shorter hours of work, are also of much importance in the continuing stability and potential growth of electricity consumption. Unfortunately assessment and comparison of the forecasts and plans of different countries, even when they are compatible, is hindered by lack of knowledge of the criteria and economic assumptions on which they are based.

NUCLEAR POWER LOSSES

We already know from statements by the chairmen of companies involved in the construction of the nuclear power stations that the work is being done at a loss. It may have been thought from this that the companies' loss was the Central Electricity Generating Board's gain. This is probably true to some extent for it means that the Board cannot be meeting the full cost of the stations. Yet at the British Electrical Power Convention Mr. F. H. S. Brown, the Board's deputy-chairman, said that the Board would lose millions in the operation of nuclear plant.

If the manufacturers derive some sort of negative comfort from this it will be tempered by the thought that it is simpler for the C.E.G.B. to recoup its losses from its customers than is the case with the companies. While the grid tariff can (and no doubt will) be adjusted to take account of the cost of nuclear power, the manufacturers in today's highly competitive conditions will hesitate to raise the prices of other of their products to cover their nuclear losses.

Through the Atomic Energy Authority the Exchequer has already contributed largely to the cost of nuclear power research and development, but it may be argued with some justice that there is a case for further subvention for work of such importance to the country's future, unless of course there is a reasonable prospect of ultimate, not-too-distant, profit from future nuclear contracts—at home and abroad.

DEVELOPING ESTABLISHED EQUIPMENT

Technological progress usually occurs in one of two forms. Major advances normally take place when there is an industrial application for a new technique or material, while there is a fairly constant development of existing equipment arising from practical experience. Very occasionally we hear of well-known apparatus which, through modification, has had its range or efficiency considerably improved. As an example of

this, we saw last week films of short-circuit tests carried out in Italy on the Johnson & Phillips type D fuse switches for overhead line protection, over a quarter of a million of which have been manufactured. Designed originally in 1934, they were given a somewhat arbitrary interrupting capacity of 50 MVA at 11 kV, but at a fairly early stage tests showed that they could be rated at 100 MVA, although absolute reliability had not been obtained. During the past five years, however, research into arc control phenomena has enabled this capacity to be increased by 50 per cent with only comparatively minor changes in design, primarily affecting the tube in which the fuse link is constrained.

It may well be thought that the operating principles of an equipment of an apparently simple concept and established for over 25 years would be fully and completely understood. Yet further study of certain aspects—a critical problem, we understand, concerned the volume and movement of the gas created by the fuse element melting—using, it must be admitted, modern research techniques has resulted in a major and most worthwhile improvement.

We cannot help wondering how many more "finalised" and long accepted designs would now benefit from further investigation and might in some cases show a more rapid return than some of the original work being carried out.

TELEVISION QUALITY AND COVERAGE

In the field trials carried out by the Television Advisory Committee no marked advantage in overall picture quality was found from the use of the 625-line system, though visibility of the scanning lines was much reduced. They considered, however, with one dissentient, that with further development of this system using a wider video bandwidth and receivers with improved noise factors 625-line pictures, particularly on larger screens, would show "a definite superiority." The higher definition system is also considered the "best compromise" and the only one likely to be acceptable to the rest of Europe as a common standard in the ultra-high-frequency bands.

The need to use these bands will depend on the decision which the Government makes on the whole question of television in this country when in the next few years it considers the future of the Television Act and B.B.C. Charter. Only one extra programme on 405 lines could be accommodated in the bands at present used and if more programmes of national coverage are considered desirable a move to the higher bands will be inevitable whichever system is adopted. The manufacturers, speaking through the Radio Industry Council, would (because of advantages of the lower bands for TV and the undoubtedly complexities involved in a mixed system) prefer the extra services to be accommodated within the existing bands. Given the need to go to the higher bands, the manufacturers are not, however, opposed to the introduction of the 625-line system.

Advanced Gas-Cooled Reactor



General view of the advanced gas-cooled reactor showing the containment building (centre), the turbine hall (left) and the fuel element building (right)

The prototype for the next "generation" of civil nuclear power stations to be built in the late 1960's is under construction at Windscale, Cumberland. The project, costing £9 million, will produce 100 MW of heat with a net electrical output of 28 MW. The fuel consists of ceramic uranium dioxide in beryllium or stainless steel cans. It is expected that the project will be commissioned in April next year and will be operating at full power by the following October

SINCE the building of the first graphite-moderated gas-cooled reactor (BEPO) at Harwell in 1948, rapid developments in this reactor system have taken place. BEPO and its immediate descendants are fuelled with uranium, the only satisfactory fissionable material occurring naturally. Calder Hall, which is the prototype of the civil stations now being built and is based on the BEPO system, provides 46 MW electrical output per reactor and was commissioned in 1956. The first civil reactors, at Bradwell and Berkeley, will each be rated at 150 MW and are due for commissioning early next year. Hinkley Point, due to commence operating in 1962, will have two reactors each rated at 250 MW electrical.

Unfortunately, the Calder Hall type reactor, which is the basis of the present generation of civil stations, has a high capital cost. The first civil stations will probably

cost about £160/kW installed, reducing to about £100/kW for the latest designs, compared with about £45/kW for an equivalent modern base-load coal-fired station. The cost of energy sent out will be about 0.7-0.8d/kWh for the nuclear stations against about 0.56d/kWh for the best conventional stations.

To improve the economics of nuclear power generation, the United Kingdom Atomic Energy Authority are actively pursuing the development of three different reactor systems, besides research into long-term projects. The three systems are the advanced gas-cooled reactor (A.G.R.), the high-temperature gas-cooled reactor (H.T.G.C.) and the fast breeder reactor. The A.G.R. is based on the experience gained from the Calder Hall type reactors and it is possible that civil A.G.R. stations will be operating in the late 1960's. The H.T.G.C. is being investigated at Winfrith Heath under the "Dragon"

experimental project. If this system shows promise, then a prototype stage will follow, but it is unlikely that civil stations using this system can be built before the mid-1970's. The third system being developed is the fast breeder reactor at Dounreay (D.F.R.), but when the first civil station of this type will be built is not yet clear, certainly not before the mid-1970's. The A.G.R. and the H.T.G.C. will be fuelled with enriched uranium and D.F.R. will use plutonium. Enriched uranium requires a complicated manufacturing process, while plutonium is produced in a reactor. Neither of these fuels was available in quantity when the U.K.A.E.A. began their programme of development of power reactors.

The next generation of nuclear power stations will, therefore, be of the A.G.R. type. At a Press conference last week at Windscale, where the prototype A.G.R. is now under construction, Sir William Cook, member of the Authority for Development and Engineering, said that they set great store by the A.G.R. It would reduce capital costs and costs of electricity production, which would make the cost per kWh sent out from a 1970 A.G.R. civil station lower than that from an up-to-date base-load conventional power station.



Top dome of the reactor pressure vessel showing the holes in the refuelling nozzles, some of which have been welded in position



The top dome of the reactor pressure vessel with refuelling branch nozzles in position. View taken after vessel had been stress relieved

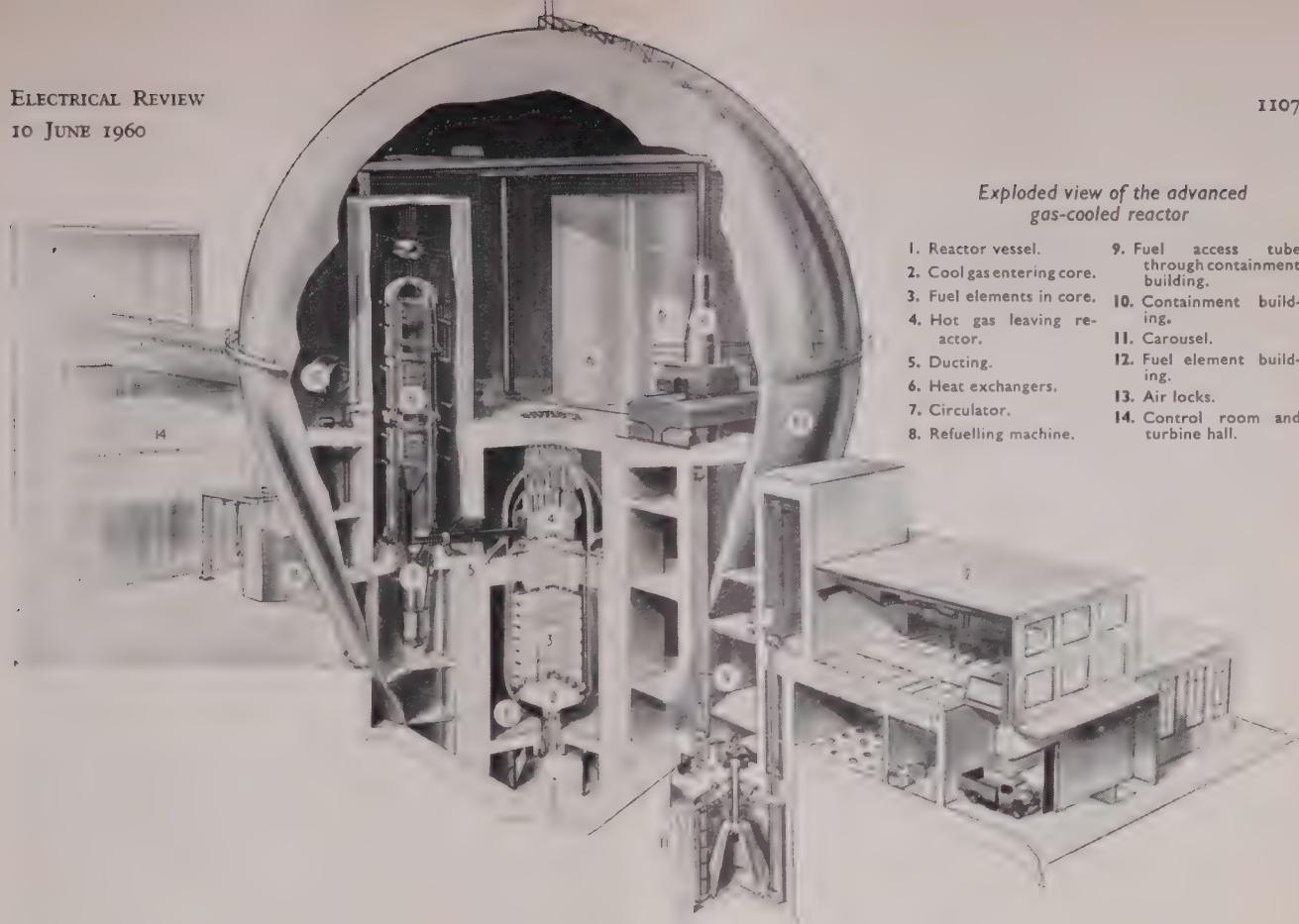
Present Limitations

The fuel elements of the present generation of nuclear power stations differ only in detail. The fuel for all is in the form of a uranium bar approximately 1 in in diameter, sealed in a magnesium alloy can; the differences are limited to variations in finning of the can and in methods of supporting the fuel element in the reactor. This type of fuel element imposes two limitations on reactor operation: the rate at which heat can be produced in the fuel and the temperature to which the carbon dioxide coolant can be heated. This restricts the power which can be generated in a reactor of a given size and the efficiency with which this power can be converted to electricity through the steam cycle. The heat production is limited to a mean of about 2.5 MW per tonne of fuel and the can surface temperature, which controls the CO₂ temperature, is limited to a nominal figure of 450°C. If either of these figures is increased, the can loses tensile strength as the melting point of the magnox alloy is approached, and at the same time the temperature of the uranium at the centre of the bar will reach 660°C, at which a change takes place in the crystal structure of uranium. This change, called the alpha-beta phase change, results in a sudden expansion of the uranium which imposes severe stresses on the can. These stresses, coinciding with a weakening of the magnox, will result in the rupture of many of the cans, allowing the escape of fission products.

Thus, any large improvement in fuel rating or reactor temperature necessitates a complete change in the fuel element and this is the principal new feature of the A.G.R. The effects of phase change in the uranium are avoided by using ceramic uranium oxide in place of metallic uranium, while the loss of strength in the can is overcome by replacing magnox by a more refractory material. Two materials are being tried out; the first is beryllium, with a low neutron cross-section, and stainless steel. These changes of course introduce new problems. Uranium oxide is a much poorer conductor of heat than the metal, and so the rods of fuel have to be made much thinner. This means a greater proportion of canning material to fuel and a less efficient system from the nuclear physics aspect; also, the presence of two oxygen atoms to every uranium atom reduces the proportion of fissile atoms in the fuel. For these reasons, some enrichment of the fuel, by artificially increasing the proportion of uranium 235, is necessary, though this is partly offset by using beryllium in place of magnox for the can, since it captures far fewer neutrons.

However, it is expected that, with this new fuel, the rating of the A.G.R. can be increased to over six times the rating of a Calder Hall reactor of the same size. In addition, it will be possible to increase the CO₂ temperature by over 200°C, which will allow the use of conventional modern turbo-generators and raise the efficiency of the steam cycle by about a third (see Table 1). The gas outlet temperature in the H.T.G.C. reactor will be about 750°C.

Because the advanced gas-cooled reactor differs very little in its general principles, other than the fuel element, from the current power reactors, it will be possible to introduce this type into the power programme fairly



readily. Only general descriptions of the A.G.R. prototype have, until now, been available but it seems that considerable progress has been achieved. The present state of construction is shown in the accompanying illustrations. The reactor vessel has been completed and stress relieved (10 hours at 600°C) and it is hoped that it will undergo pressure (400 p.s.i.) tests shortly. The commissioning is due to take place next April.

The reactor will generate 100 MW of heat giving a net electrical output from the station of 28 MW. This size has been chosen to obtain statistical information on fuel elements in operation. The reactor incorporates five loop systems for the testing of fuel elements under more varied and advanced conditions than is possible in the reactor. It is designed for maximum flux range rather than maximum output and is, therefore, not flattened. Experiments will be carried out over a wide range of temperatures and ratings and individual channels can be "gagged" to control mass flow.

The station consists of the reactor unit, which is housed within the spherical steel containment building, the fuel element building and the turbine hall. The fuel element building contains the clean fuel element store and breakdown and inspection facilities for the irradiated fuel. A rotary store or carousel for irradiated fuel is

situated below ground between the fuel element building and the containment building. On the other side of the reactor is the turbine hall, which also houses the 110 per cent dump condenser and the diesel generators to supply the standby power. The control block, which is situated at the reactor end of the turbine hall, contains the switchroom, standby batteries, motor-alternator sets for instrumentation control, the reactor control room, the electrical control room and the change rooms adjacent to the personnel air-lock giving access to the containment building.

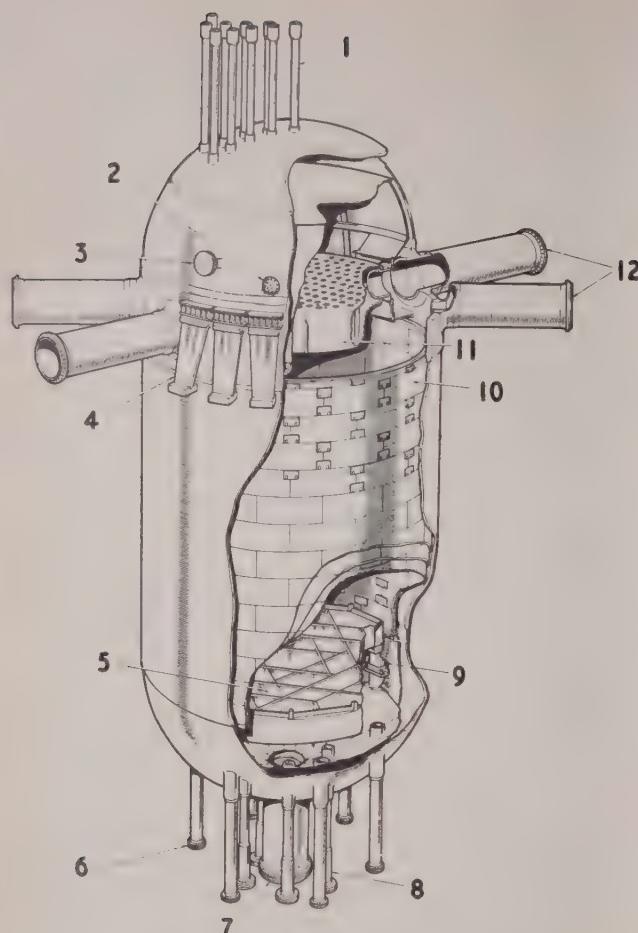
Pressure Vessel

The 250-ton vertical reactor vessel, which consists of welded aluminium-killed grain-controlled mild steel, is designed for a working pressure of 270 p.s.i. with CO₂ inlet temperatures of 250–325°C and coolant outlet temperatures of 500–575°C. The vessel has hemispherical top and bottom ends and measures 21ft 3in in mean diameter by 53ft 6in long overall. There are 253 branches in the top dome, each corresponding to a channel in the core and ranged on a 10³in triangular lattice pitch. This allows the complete stringer of fuel element assemblies and shield plugs to be withdrawn as a single unit. It also facilitates instrumentation of the fuel elements and up to seven thermocouples may be installed in each channel.

The reactor vessel is supported at the upper end of the barrel section at the same level as the gas ducts, thus eliminating vertical expansion problems and allowing short rigid concentric ducts to be fitted between the reactor and heat exchangers. The latter are supported at the same level and move bodily on ball bearing supports in the radial direction of the reactor. When fully loaded, the vessel will weigh nearly 1,000 tons.

TABLE I.—Comparison of essential parameters between Calder Hall, civil reactors of the Magnox type, and the A.G.R. prototype

	Calder Hall	Magnox Civil Reactors	Windscale A.G.R.
Maximum fuel rating (MW/Te uranium)	3	4–5.5	19.5
Inlet coolant temperature (°C)	140	160–200	250–325
Outlet coolant temperature (°C)	336	345–400	500–575
Coolant pressure (p.s.i.)	100	125–240	270



Exploded view of the A.G.R. pressure vessel

1. Standpipes. 2. Flux scanner branch. 3. Thermocouple branch. 4. Vessel supports. 5. Diagrid. 6. Six viewing branches. 7. Bottom access branch. 8. Six test rig branches. 9. Diagrid support (roller unit). 10. Thermal shield. 11. Hot gas manifold. 12. Gas ducts.

The thickness of the reactor vessel barrel is $2\frac{7}{8}$ in but is increased in the region of the ducts and supports to $4\frac{3}{8}$ in and in the top dome to $3\frac{7}{8}$ in.

An internal neutron shield is placed above the graphite core within the pressure vessel. This reduces the thickness of the biological shield above the neutron shield and prevents neutrons streaming along the ducts. It also allows access on shutdown to the outside of the upper shell of the reactor vessel for inspection and maintenance purposes. This shield consists of layers of graphite and boron steel. The graphite core structure below the neutron shield is self-compensating and is of solid construction, i.e. each brick is in contact with its neighbours. The core is mounted on ball bearings which are supported by the diagrid.

In the Calder Hall type reactors a thermal shield is located outside the pressure vessel. The A.G.R. thermal shield is within the vessel, which helps to prevent damage to the pressure vessel itself and requires no separate cooling.

Four heat exchangers with 170 h.p. gas circulators are installed. The circulators driving motors are contained within pressure bells, forming extensions to the bases of the heat exchangers. This eliminates the necessity for a rotating gas seal. The circulators are driven by squirrel-cage induction motors or, alternatively, by 40 h.p. variable-frequency pony motors, fed from a

guaranteed supply. Both are mounted on the same shaft and are cooled by water coils. The 1,570 h.p. induction motors were supplied by Laurence, Scott & Electromotors, Ltd. Mass flow control of the reactor coolant is obtained by variable-pitch guide vanes at the inlet to the circulator. Flow is upwards through the reactor and heat exchanger tube banks. This gives increased natural convection on the gas side under fault conditions. After passing over the tube banks, the coolant flows down the spaces between the banks and the pressure shell of the heat exchanger into the circulator inlet and then via the annulus between the two ducts to the reactor vessel, where it cools the shell before flowing upwards through the core. Part of the cool gas also flows down through passages between the graphite bricks of the core. A small amount of heat is generated in the graphite but the cooling keeps the temperature only slightly in excess of the gas inlet temperature. This temperature is high enough to prevent build-up of Wigner energy.

The hot outlet gases emerging from the core of the reactor will be at too high a temperature to permit their impinging upon any part of the pressure shell, and it has been necessary to introduce a large disc-shaped collector box above the core into which all outlet gases will flow. This hot gas manifold has to withstand a differential of about 30 p.s.i. between inlet and outlet gas pressures and, as it is interposed between the vessel stand pipes and the top of the core, openings for every stand pipe position are required. Hot gases from this collector box will pass out of the vessel through four ducts which pass concentrically inside the ducts carrying the inlet gas to the vessel, again so that no impingement of hot gas shall occur on the main pressure parts.

In addition to the branches associated with five experimental loop systems, there are viewing branches to facil-



Main section of one of the heat exchangers being lowered into its shield within the containment building

Main CO₂ circulator

1. Main motor. 2. Pony motor. 3. Radial flow impeller. 4. Vaned diffuser. 5. Variable inlet control seals. 6. Standstill seal. 7. Stub shaft. 8. Stainless steel insulation. 9. Pressure vessel. 10. Pressure bell. 11. Motor cooler. 12. Michell bearing. 13. Michell thrust bearing. 14. Rotor brake. 15. Impeller removal device. 16. Standstill seal operating spindle. 17. Terminal box. 18. Heat trap. 19. Main heat exchanger vessel. 20. Main CO₂ circuit. 21. Motor cooling circuit.

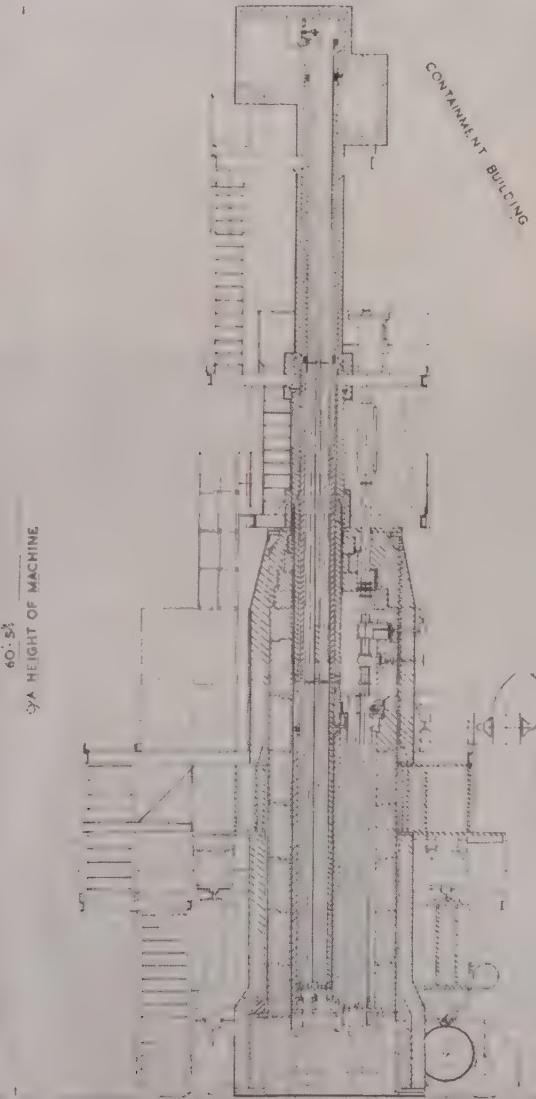
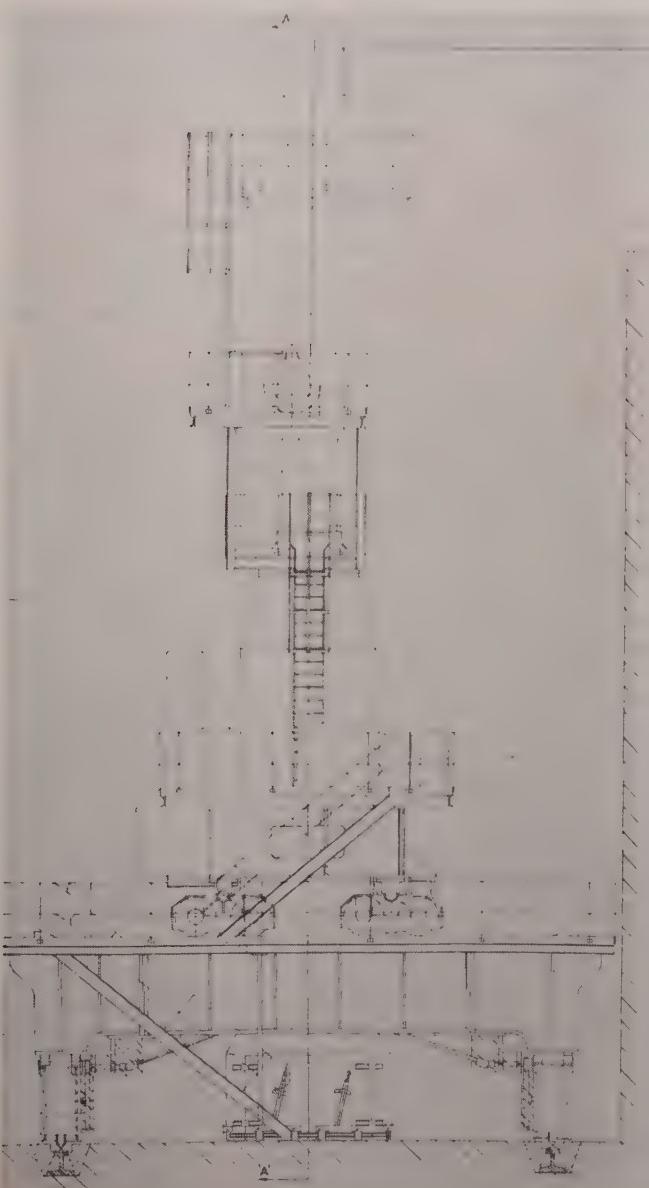
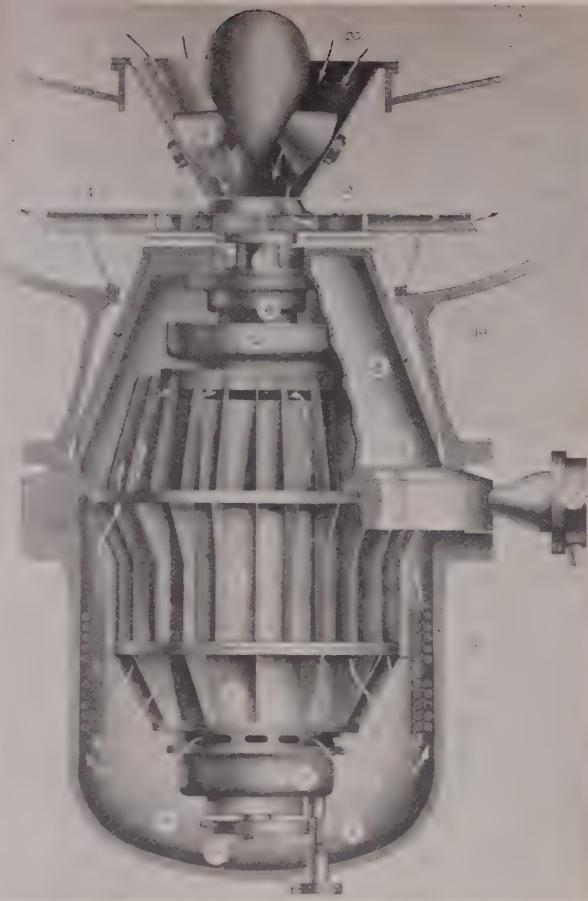
tate inspection of the base of the reactor by remote means, including a television camera.

The four International Combustion heat exchangers each have a rating of 25 MW (heat) and are capable of generating 78,350 lb/hr at 660 p.s.i. at 860°F after the desuperheater. Each exchanger consists of an 11 ft diameter shell about 70 ft high manufactured in three sections housing the economiser at the top, the evaporator and superheater, and the circulator, which is mounted in the bottom head as already described.

Charge-Discharge Machine

The reactor will be refuelled on load by a single refuelling machine being supplied by John Brown (S.E.N.D.), Ltd. Under normal operation the machine will be capable of removing and replacing three fuel element stringers a day at full reactor pressure and at

On-load charge and discharge machine. This machine contains a normal handling pressure vessel and a special handling pressure vessel for use during an emergency or for observations within the reactor



a higher rate under shutdown conditions and atmospheric pressure. The machine, which is 65ft high and weighs 400 tons, consists of a normal handling pressure vessel, 2ft in diameter and 56ft long, supported vertically on a superstructure. There is also a special handling pressure vessel for use during an emergency or for observations within the reactor. Both vessels are shielded against gamma and fast neutron radiation, involving some 200 tons of cast iron and laminated wood.

Independently of all extraneous mechanical aids, the machine will travel the full floor width of the containment building, and position itself to within 0.005in of any of the 253 reactor refuelling branch pipes. The machine will also be able to move or replace control rods and mechanisms, emergency shutdown devices and graphite sampling equipment. It also serves the five loop systems. During the refuelling operation, a nose is extended from either the normal or the special pressure vessel and connects with the refuelling branch, effecting a seal between the machine and the reactor. The hoisting connection between the machine and the fuel plug string is made manually. After completing the seal the spent fuel plug string is slowly hoisted into the three-position magazine in the normal handling pressure vessel. The magazine is rotated and the new fuel plug string is lowered and locked into the reactor.

Operating floor level inside the turbine hall



Turbine hall nearing completion

During hoisting a fuel element cooling system in the machine takes over from the reactor coolant circuit without break and until the spent elements are disposed of. The normal handling pressure vessel and the entire cooling circuit are designed for a pressure of 500 p.s.i. and the designed temperature of most parts is 325°C.

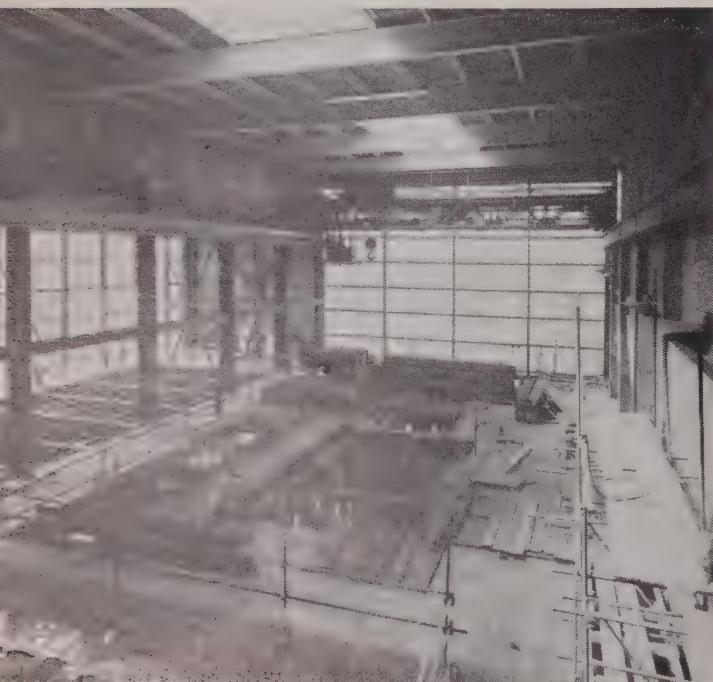
Should a fuel element fracture inside the reactor, it is possible, by using the special handling vessel, to inspect the reactor charge tube with a television camera. Provision is made for continuously viewing parts being handled by either the normal or special handling facility through closed circuit television equipment.

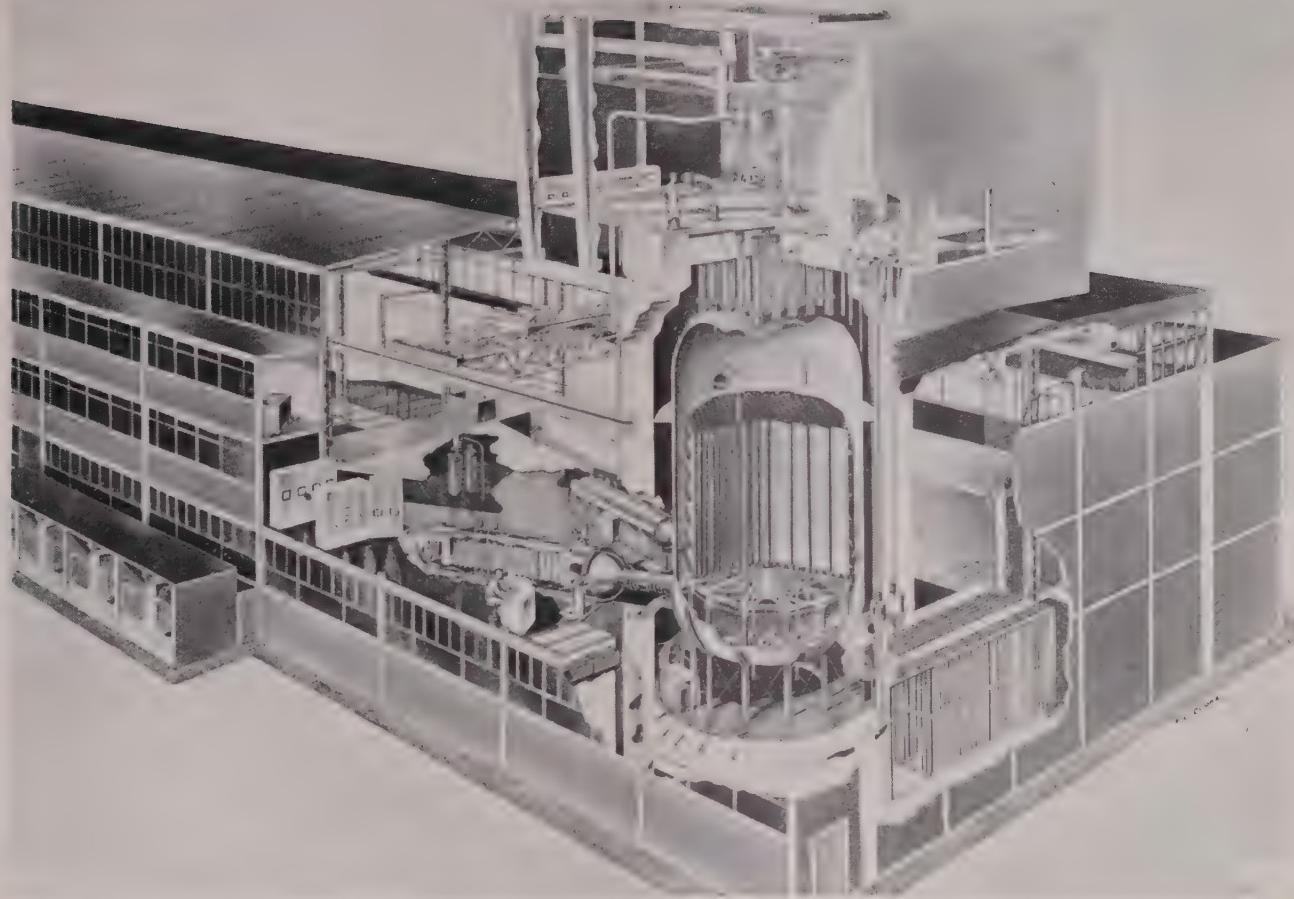
Fuel Elements

The high temperatures in the A.G.R. are achieved by the adoption of the ceramic uranium dioxide as fuel and beryllium or stainless steel as the canning material. Uranium dioxide has a melting point of 2,800°C and an ability to withstand high irradiation doses. It is confidently expected that irradiation substantially in excess of 6,000 MWD/Te will be obtainable.

Beryllium has a very low neutron absorption cross-section and a high thermal conductivity. It is, however, relatively little known and has a low ductility. Its melting point is 1,280°C and the designed operating surface temperature of the beryllium can, which is limited by its compatibility with CO₂, is 600°C. Stainless steel has the disadvantages of high neutron absorption cross-section (demanding greater enrichment of the fuel) and low thermal conductivity. Its melting point is 1,400°C and the operating surface temperature of the stainless steel can is 650°C. A considerable programme is in hand both within the U.K.A.E.A. and in industry on the development of both these types of can.

The first charge of the A.G.R. will consist of 80 per cent beryllium canned elements and 20 per cent stainless steel canned elements. The high rating is obtained by





Artist's impression of the HERO reactor and gas circuits

the adoption of a cluster arrangement in the fuel elements to give a large specific surface area. This also ensures that the maximum operating temperature of the uranium dioxide is kept to an acceptable figure. In the beryllium design each cluster contains 36 fuel element rods, 0.3in in diameter and 12in long, and there are three clusters per fuel element assembly. The rods are held in position between beryllium support plates which in turn are located by graphite sleeves. The assembly is contained within an outer graphite sleeve. There are four such assemblies to each channel and they are held together by a central stainless steel tie rod supported from the lower end of the neutron shield plug.

The stainless steel design is similar, except that there are only 21 fuel element rods per cluster and each rod is 0.4in in diameter by 8in long. There are two such clusters per fuel element assembly. In both designs, the uranium dioxide is manufactured in pellets of a length equal to their diameter.

Control of Reactor

The rate at which power changes occur following some disturbance is expected to be slightly higher than in the magnox type of reactor. This effect is more than outweighed by the higher margins in hand between fuel and can operating and melting temperatures. The reactor is controlled in the conventional manner by boron steel rods suspended from the control mechanisms which are housed entirely within the refuelling branches to give clear access to the refuelling face. In addition to the

normal control equipment, secondary shutdown devices actuated by a rise in fuel temperatures permit boron steel balls to be injected into tubes within the reactor.

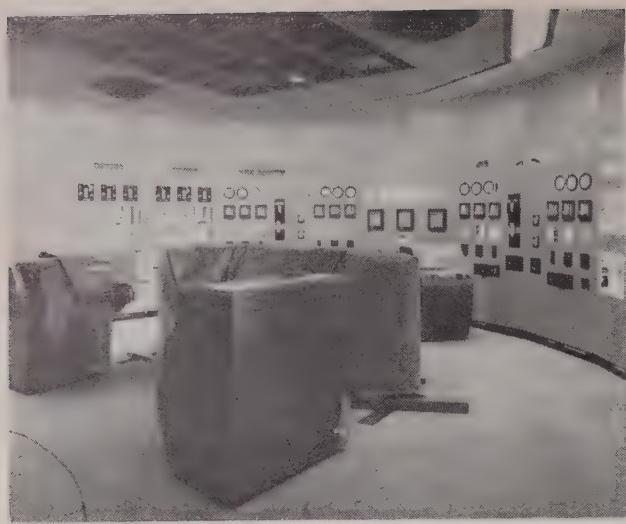
New fuel elements pass from the fuel element building through the "clean way in" to the containment building, where they are attached to the fuel plug string and the instrument connections are made. The assembly is then lifted into the clean zone of the normal handling facility in the refuelling machine. On discharge, the fuel elements are detached from the plug string in the refuelling machine and lowered into the carousel where the activity is allowed to decay. They are then lifted into the adjoining fuel element building for either metallurgical examination or breakdown prior to subsequent chemical treatment.

Containment Building

In view of the experimental nature of the reactor, it is enclosed in a steel containment building. This building consists of a large conical section surmounted by a hemisphere, 70ft in diameter at the base, 135ft in diameter at the equator and 134ft high above ground level. The maximum thickness of the steel is 1½in. It is designed for a pressure of 10 p.s.i. and is to be tested at 12.5 p.s.i. Three air locks are provided for personnel, goods and emergency exit.

Turbo-Generators

Steam is generated in the heat exchangers at 650 p.s.i. and 454°C (850°F) at the turbine stop valve. A 900 p.s.i. 900°F system would have been possible but it would



Reactor control room

not have been as flexible for experimental purposes as the lower-pressure system adopted. The single English Electric 33 MW turbo-generator operates at 3,000 r.p.m. and generates at 11.5 kV. The turbine is of a standard two-cylinder design with single-flow h.p. cylinder of the impulse type. The l.p. cylinder is of the double-flow reaction type with the exception of the first stage in each flow which is of the impulse type. The vacuum at the continuous maximum rating is 28.6 in Hg with a final feed temperature of 350°F.

The alternator is a standard air-cooled machine with separate motor-driven fans. Excitation is provided by a totally enclosed air-cooled exciter driven from the tail shaft of the alternator through a flexible coupling. It uses magnetic amplifier automatic voltage regulators.

The feed water heating scheme comprises one l.p. heater, two 50 per cent high level de-aerators and two banks of h.p. heaters, both of which are arranged with two 50 per cent heaters. The condensing plant is of English Electric standard twin-shell design, the circulating water temperature being 68°F at 24,500 g.p.m. The total surface area of the condenser is 31,800 sq ft. There is also a full capacity Hick, Hargreaves dump condenser which can be used to reject the reactor heat load if the turbine is out of commission. The Davenport cooling tower is rated at 1.755 million gal/hr and is of the forced draught type.

Blast walls have been erected in the turbine hall to protect the reactor electrical standby and control equipment against accident conditions, whether due to turbine faults or to failure of the cooling water mains. The standby diesel generators are protected by one blast wall and a second wall protects the control room block on the turbine hall side.

HERO Reactor

One of the prime functions of the A.G.R. prototype reactor is to assess behaviour and life of the fuel elements at high neutron flux and temperature. This demands long periods of continuous operation at maximum power. Of equal importance to the development of the A.G.R. type civil reactors is the study of the reactor physics of the system. This implies a low neutron flux to enable subsequent access to the reactor to be obtained for

rearrangement of the core and experimental equipment. A research reactor is, therefore, also being built at Windscale, and has been named HERO (heated experimental reactor zero energy).

The flexibility of the HERO reactor is such that graphite-moderated core arrangements other than the A.G.R. type can be investigated. Among the investigations to be made with HERO are measurements of flux distribution in the core, effect of rearrangements of fuel elements within the graphite moderator, effect of variation of fuel element pitch and effect of temperature differences between the fuel and graphite. The temperature of the core is controlled by means of an automatic control system regulating the electrical power supplied to the heaters.

Other Facilities

A number of other facilities are being built at Windscale in connection with the A.G.R. programme. The Reactor Physics Group are carrying out preliminary experiments to assist the start-up of HERO and the A.G.R. Other experiments will be made on exact replicas of part of the A.G.R. core to supplement work on the A.G.R. itself.

The research and development branch are building a fuel element handling and examination service and it is intended that one or two stringers a week will be selected for examination from the A.G.R. in a number of specially designed caves equipped with fully automatic machines and manipulators.

The main contractors are:—Reactor pressure vessel, Whessoe, Ltd.; refuelling machine, John Brown (S.E.N.D.), Ltd.; reactor containment building, Babcock & Wilcox, Ltd.; control rod mechanisms and frequency convertor sets, Elliott Bros. (London), Ltd.; main CO₂ circulators, James Howden & Co., Ltd.; heat exchangers and carousel, International Combustion, Ltd.; civil engineering, Whatlings, Ltd.; turbine, feed heating plant, 33 kV switchgear, English Electric Co., Ltd.; dump condenser, Hick, Hargreaves & Co., Ltd.; 11 kV switchgear, A. Reyrolle & Co., Ltd.; 415 V switchgear, Switchgear & Cowans, Ltd.; motor-alternator sets, General Electric Co., Ltd.; general electrical installations, N. G. Bailey & Co., Ltd.

SYMPOSIUM ON SEMICONDUCTOR DEVICES

THE fourth annual symposium on transistors, held at the Borough Polytechnic, London, S.E.1, recently, was attended by some eighty engineers and physicists from leading firms and organisations throughout the country. The theme of this year's symposium was "Semiconductor Devices," and an excellent start was given to the proceedings by a discussion on "Tunnel Diodes" introduced by Dr. G. N. Roberts and Dr. R. W. A. Scarr (S.T.C.). This was probably the first large-scale public discussion of this important new device. Much interest was also shown in a lecture on the application of transistors to television receivers by speakers from Plessey and Semiconductors, Ltd., who demonstrated a completely transistorised set. The policy of the symposium was to invite introductory papers from leading research workers on the topics to be discussed, and in this way views were drawn from a wide range of organisations, including the G.E.C., Ferranti, Standard Telephones & Cables, Ltd., S.E.R.L., Texas Instruments, Ltd., and Newmarket Transistors, Ltd.

The Bournemouth Convention

Last week we published abstracts of the four papers presented at this year's British Electrical Power Convention held at Bournemouth under the presidency of Viscount Chandos, and in the following pages we give summaries of the discussions. An account is also given of the many interesting points raised at the Electrical Forum; the speeches at the annual dinner; and the proceedings at the annual meeting

OPENING the discussion on Mr. H. G. Nelson's paper "The New Horizon—Electrical Manufacture," Mr. F. H. S. Brown (C.E.G.B.) said that the author mentioned that a simple extrapolation of recent large increases in the size of units would give a set of about 4,000 MW in 1980, but he did not give a similar extrapolation of recent trends in cost per MW. This was understandable, because it would show that in the 1980's the manufacturers would be providing the sets for nothing and at a later date would be paying the Generating Board to take them away. Broadly, what had happened in the recent past was that both sides of the industry had been catching up on the development which could not take place in the war years and the immediate post-war period, but they were now back on the point of the curve which they would have reached had not the war intervened.

The author suggested that in the 1970's there would be two-shaft units of about 2,000 MW, but Mr. Brown thought it more probable that there would be single-shaft machines of about 800 MW. With units of this size the capacity of the links in the grid system might become more important than the capacity of the system as a whole. If the size of a single unit exceeded the capacity of a single transmission line it would be necessary to provide more than one transmission line to cover the

engineering continued to advance, and the necessary research and development would be very costly. It was not only the manufacturers, however, who were losing money on nuclear stations; the supply side would lose millions of pounds each year throughout the life of the nuclear stations now being built, because the capital charges would be so great that the overall cost would be much higher than that of contemporary coal-fired stations. In this matter both sides of the industry were engaged in an act of faith, but he considered the policy to be justified and in the long term it would pay both of them.

Mr. A. N. Irens (South Western Electricity Board), emphasising the importance of reliability of supply, said that there could be no complaint about the reliability of the plant; British-made plant was good plant. None of them was satisfied, however, with the reliability of supply, which today was more important than ever before. No manufacturer would install expensive electrical plant for carrying out a process unless the supply was reliable, and in certain cases even a transient dip in voltage could cost thousands of pounds in resetting tools. In hotels there was a reluctance to install electric cooking because of the possibility of interruption of supply, and in the domestic field an interruption led to more than the bringing out of candles; it could cause chaos in the home.

Fresh consideration must therefore be given to providing a really sound supply, for which consumers were ready to pay. The supply side would like help from the manufacturers in providing devices and techniques which would ensure reliability, and more thought must be given to the undergrounding of cables. It might not be possible to put 132 kV lines underground, but it should not be regarded as inevitable that 11 kV, 33 kV and l.v. systems must be overhead. The traditional way of making cables by wrapping thousands of miles of paper round a copper core was a tedious and costly way of providing insulation between conductor and earth. Experiments were being conducted with thermoplastic l.v. cables, but whether that could be applied to 11 kV he did not know. Undergrounding was important not only for regularity of supply but from amenity considerations.

Mr. S. Z. de Ferranti pointed out that long before a four-fold increase in income had been achieved this country would run into balance of payment problems; any increase in income led to increased imports, while the developing countries sought to establish manufactures and keep out imports by tariffs and controls. We could maintain our share of world exports only by maintaining a strong technical lead, which entailed spending vast sums on research and development. The very poor



Mr. H. G. Nelson, managing director of the English Electric Co., Ltd., presenting his paper on "Electrical Manufacture"

outage of such a unit, so that if the economic return from such large units was small their installation might not be attractive.

He agreed that it might be possible in ten years to generate power by base-load nuclear stations more cheaply than with coal-fired stations, but only if technology and

return on capital which had been a feature of the industry for some years past was therefore disturbing. Unless there could be some agreement on prices between manufacturers the supply industry would be left with only one manufacturer.

He felt that much more could be done by the Area Boards offering more attractive off-peak tariff differentials for domestic heating. For some ten years his company had used electrode boilers with thermal storage heating in their Wythenshawe laboratories. This was a good method, but a very expensive one. He believed that in industry the use of data processing and computer techniques would have tremendous advantages and be even more important in the future than the atomic energy programme.

Mr. R. W. Flux (Bruce Peebles & Co.), examining some of the ground "between here and the horizon," said the author envisaged the infliction of severe rationalisation on manufacturers, but this was likely to apply mainly to generating plant, because of the enormous increase in the size of individual units. For transformers the position might not be so bleak; there must be a continuing increase in the number of transformers required, and the smaller firms believed that they could continue to play a valuable part in this field.

It was not in the public interest to make the lowest price the over-riding consideration in selecting suppliers for transformers; some regard should be paid to the technical ability and promise shown by design teams. Low prices might result not from manufacturing efficiency but by subsidisation from other more profitable products, and he did not think the supply industry would wish equipment to be subsidised from resources which ought to be employed in research and development, but which instead were diverted to "staving off death by a thousand price cuts." Through B.E.A.M.A. and the structure of the Electricity Boards the industry had unequalled facilities for working together and it should try, with the co-operation of the Board of Trade, to decide what really was broadly in the public interest.

Sir Josiah Eccles said he would like to see the paper brought to the notice of shop stewards and discussed in works committees, because it was important to remove the "they" and "we" complex in British industry. Some might take comfort from the thought that because world trade was expanding this country did not need to have such a big share of it, but that was too easy a view. We needed to produce savings which would enable less-developed countries to make a start, so as to increase world trade; it was not enough merely to export sufficient to pay for our imports. In competitive selling abroad success depended on our techniques being better and our costs lower than those of our competitors. It would be presumptuous to assume that our techniques could continue to be better than those of other advanced industrial countries, so that we had to be competitive in costs and delivery with countries such as Germany, Switzerland and Japan.

Co-operation Preferred to Competition

On the manufacturing side of the industry it was co-operation rather than competition which was needed. Cut-throat competition was the world's worst way of running an industrial community. The time would soon

come when the industrial countries of the world would have to get together to stabilise prices to enable everyone to make a reasonable living.

Dr. D. S. McIlhagger (Queen's University, Belfast) recalled that more than ten years ago Dr. Forrest said that if insulation development took place the pylons for the 275 kV system could be used for 380 kV. There had, however, been no development in design in the past decade; we were still a "cap-and-pin" community, and the only way to increase the voltage of transmission lines was to increase the length of insulator strings. That meant that with existing pylons underground cables would have to be used, because the transmission lines would soon be trailing along the ground. He suggested that applied and fundamental research should be directed in a massive way at preventing the breakdown of insulators over the surface—or else concentrated on the manufacture of underground cables.

Mr. J. O. Knowles (Metal Industries, Ltd.) hoped that the author would take steps to "debunk" the figures which were so often quoted to show that much greater horse-power per man was used in America than in this country. This country had less need than America to use vast quantities of power to deal with raw materials, since work on them should be done before they were imported, and the population in Western Europe generally was more concentrated than in America, where much more power had to be used in transport.

Mr. G. F. Kennedy (Kennedy & Donkin) suggested that this country was missing a great chance by not establishing branch industries in the electrical field in Latin America. In the next ten years there would be an enormous growth in the demand for all kinds of electrical equipment in that part of the world, and other countries were taking advantage of the lack of manufacturing facilities there to establish branch industries. Mr. E. T. Norris (Ferranti, Ltd.), referring to forecasts of future expansion, pointed out that a large proportion of electrical power was just plain heat, and for the domestic load low-temperature heat, and it might not be justifiable to supply the country with this lowest form of thermal energy by the present system. There were many new developments such as direct conversion, fuel cells and thermocouple generation which were being intensively studied by American universities. More attention should be paid to these possibilities.

Mr. Ernest Long (C.E.G.B.) emphasised that it was not the practice of the Electricity Boards necessarily to accept the lowest tender, but to make a very careful economic and technical assessment of competitive tenders, and in this way reap the benefits of progress which had been assured by competition. While agreeing that the present method was not entirely satisfactory, he invited the manufacturers to put forward constructive proposals which would retain the benefits of price competition and ensure research and technical development, while avoiding cut-throat competition.

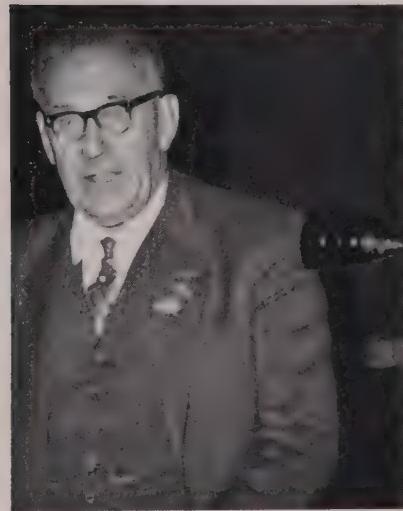
The author, in a brief reply to the discussion, agreed that there was not yet enough technical knowledge to go to 500 kV or above for transmission but urged that steps should be taken to obtain the necessary experience by full-scale experiment. He wondered whether there was sufficient exchange of experience between the operating and manufacturing sides of the industry to ensure that

the experience of the supply side on sources of unreliability was known to the manufacturers, so that their research and development programmes were directed in the best way to achieve reliability.

A vote of thanks to the author, proposed by Mr. Norman Elliott, was carried by acclamation.

ELECTRICITY SUPPLY

Mr. Norman Elliott (South Eastern E.B.) opened the discussion on Mr. C. Robertson King's paper "Electricity Supply" by referring to the author's statement that there was a shortage of technologists and technicians and



The second paper, on "Electricity Supply," was contributed by Mr. C. Robertson King, chairman of the Electricity Council

that thousands of posts had not been filled. The results of the present drive in scientific and technological education, he said, already exceeded expectations and he suspected that estimates of vacancies tended to be too high. There might soon be not enough jobs to go round, and before the end of the 'sixties a brake might have to be put on the present drive.

On the subject of amenity, the problem of reconciling the works of man with the works of nature was never likely to find a completely satisfactory solution. The author suggested as a partial solution increasing the transmission voltage to 500 kV, and Mr. Elliott agreed and thought that even 750 kV might be considered, but was all the projected transmission capacity really necessary? The estimated transfer of energy from the Birmingham area to Thames South and the Northern areas in 1964-65 was equivalent to the transport of 7½ million tons of coal a year, but might not it be better to transport the coal and not erect the lines? Electrical transmission was cheaper than transporting the coal only if the transmission lines were fairly fully loaded and the long-distance transmission of peak loads could never be justified economically.

He agreed with the author that fast breeder reactors were promising sources of power, but thermo-nuclear fusion would be even better, and there were grounds for confidence that by 1970 there would be devices for producing it which might "break even" economically.

Mr. A. R. Cooper (C.E.G.B.) said that the most important estimate was that against which new plant was ordered, and this had to be made at least four years in

advance. The plant designed to meet last winter's load had been ordered against an estimate prepared in 1953, which had forecast a very much lower load than that which actually occurred. It had been possible to get through the winter without trouble only because the people in the stations achieved a plant availability of over 93 per cent instead of the 88 per cent planned for, and this produced over 1,500 MW more than the planned figure. A tribute was due to all those responsible.

A good deal was heard about the magnificent achievements of their industry, but probably a man from Mars would be appalled. It was not an efficient industry; it was "simply awful." No industry which threw away two-thirds of its raw material could be proud of itself. In a year in which the industry bought 45 million tons of coal it would convert 15 million into electricity; 30 million it would use for heating rivers, the sea and the atmosphere, which it would do pretty efficiently but not intentionally. To burn this coal it needed 100,000 tons of oxygen, and to get it would pump through its furnaces 500,000 tons of air; four-fifths of the gases which came out of the chimneys should never have gone into the station. Something fundamental had to be done. The difference in efficiency between a 60 MW and a 120 MW set was 5 per cent; by going from 120 to 275 MW there would be an increase of 2 per cent, while by going from 275 to 550 MW the increase in efficiency would be 0.7 per cent. The history of evolution indicated that with diminishing returns of that pattern a situation was reached where there had to be a "break-through" into something new. While the industry had a future to which it could look without alarm or despondency, it was a future in which big things would have to be done and quite unusual things in quite unusual fields.

Electrical Careers for Girls

Miss Mary George (E.A.W.), speaking of the need to induce more women to enter the electrical engineering profession, said that there were signs that the industry was beginning to realise what had long been recognised in the Civil Service, that is was possible to put a woman in charge of men without upsetting the whole system of the universe. The industry might help by inviting careers mistresses and members of parent-teacher associations to visit power stations and factories to gain some idea of the jobs in which girls might be usefully employed.

Mr. E. Bates (North Eastern E.B.), dealing with the influence of tariffs on load factor, said that for normal industrial consumers the cost of electricity was only a small fraction, often less than 2 per cent, of their total production costs, and they were unlikely to make special efforts to control their load in order to secure marginal savings. For a few consumers there was now the possibility of a special tariff for disconnectable loads, but it would be unrealistic to rely on any form of tariff to bring about a substantial improvement in load factor. Better results would be obtained by promoting new loads which need not themselves have high load factors but, taken with existing demand, would lead to an overall improvement. They should be bolder in their utilisation research and must continue to advocate all forms of storage space heating, in spite of the severe competition from other fuels. Any form of increased domestic use would

improve the load factor because of the very high diversity of this type of load. The use of domestic space heating had been growing without any apparent worsening of overall load factor. Progress would be slow with any form of heating which called for time switches, separate wiring circuits and separate meters, and the additional cost of such items would be a serious deterrent. It would be necessary to accept some on-peak component of the domestic heating load. A continuous small load to provide background heating with direct radiant topping-up might be the answer.

Mr. J. R. W. Murland (Electricity Undertakings in Northern Ireland), speaking of the frequent references made to the large amount of money spent on research, said that last autumn in Northern Ireland there had been a serious outage due to salt spray deposit. At the end of the year they had had a surplus running into six figures, which by statute should be used for a reduction in tariffs, and they had asked themselves "If we did not reduce our tariffs, could we spend this money in such a way as to prevent a similar outage from this cause?" The answer had been a categorical negative, and so they had reduced their tariffs, but they knew they might have another outage due to salt spray in similar weather conditions and that no amount of money spent on research was likely to help them.

In Northern Ireland the average cost of connecting a rural consumer had risen from £118 in the five years ending with 1954 to £150 for the five years ending in 1959. It was probable that in the foreseeable future the public demand for electricity, stimulated by TV, would mean that supply undertakings would have to connect everybody, even if it was necessary to spend £1,000 to connect a man who used only a couple of 60 W lamps and a TV set. It might be wise to consider how that should be done when they were compelled to do it. As an industry they should think more sanely about their tariff structure. The Northern Ireland Board had 14 tariffs. From two of these the Board obtained 66 per cent of its revenue and they applied to 80 per cent of the consumers. Even if it cost a little money to change the other tariffs it seemed desirable to limit the number to two or three. Supply engineers should concentrate on giving a reliable supply rather than turn themselves into an accountants' and statisticians' benevolent association.

Buried Transformers

Mr. J. Gogan (National Inspection Council) said the author advocated the burying of transformers on a considerable scale. Forty years ago Mr. Gogan had had the pleasure of lifting out buried transformers at Clydenebank, where the whole system had been laid out with buried transformers in 1908. In his paper Mr. King said that "It may be thought that, in comparison with the generating programme, the distribution programme includes little that is novel." How right he was!

In forty years' time the working week might well be reduced to 25 hours. Over the last forty years it had been reduced from 55 to 40 hours. What effect would this have on load factor, if the growing industrial load had to be squeezed into a 25-hour week?

Mr. W. Gilchrist (Merseyside and N. Wales E.B.) said that the load factor in his area was 53 per cent and his

Board was interested in all methods of improving it, but on the domestic side they would have to floor-warm 24,000 flats to improve the load factor by one per cent. Much more could be done on the industrial side, where electricity could be used for many processes in place of steam. In the hospitals of this country many miles of steam pipes were used to operate small sterilisers and so on. The Boards had to find money with which to improve reliability of supply, and this could be done by raising tariffs; in his own area an increase of 10 per cent would have provided £3,600,000 last year to help in providing reliability.

Transmission Voltages

Dr. D. S. McIlhagger (Belfast), commenting on the suggestion of transmission voltages as high as 750 kV, pointed out that a transmission line must operate at or near its natural impedance load, so that a 750 kV line would transmit about 2,500 MW. A 2,500 MW transmission line was not something to be lightly undertaken and it would not be possible to contemplate such lines at the moment. There had been considerable research in Russia, Sweden and Japan on the subject of h.v. d.c. transmission and a comprehensive report had recently been given to a C.I.G.R.E. conference. These people did not envisage more serious difficulties with insulators with d.c., but he disagreed. There would be problems of electrolysis and many others which would lead to the destruction of hardware, erosion of insulator surfaces and mal-distribution of voltage over insulator surfaces and early breakdown under poor atmospheric conditions. With a.c. the forces of capacitance helped to produce uniform distribution over the insulator surface, but they were lacking with d.c., with which voltage distribution could be controlled only by conductance. Attention should be devoted to producing a semiconducting insulator or an insulator with a satisfactory semiconducting glaze which would not erode away near where the corona discharge took place, because then when d.c. transmission arrived they would not find themselves without an insulator to support their transmission lines. The electrical engineer did not avail himself sufficiently of the work of the chemist; they worked in separate vacua and did not even read each other's contributions.

Mr. F. J. Lane (Preece, Cardew & Rider) referred to matters on which investigation would be necessary in regard to transmission. There was the question of the space taken up by the very large h.v. substations, which was becoming a problem all over the world. With 400-500 kV the space required was greater than civilised communities would accept. These high voltages would have to be introduced into the heart of urban areas, which would add to the difficulties and emphasise the importance of concentration in size. H.v. substations must be made much more compact. It was necessary to get as much power as possible over a particular wayleave. In Sweden this was being dealt with by increasing the number of conductors, and something could be done by increasing the voltage. He and Dr. Forrest had suggested some time ago that the 275 kV system could be used for 380 kV when the necessary research had been carried out and 380 kV insulators could be provided in the space now occupied by 275 kV insulators. He believed that that time had now arrived. At present d.c. was likely to be

useful only with very high power and very long distances and for submarine transmission, but, with the experience gained from these exceptional cases, greater possibilities would appear.

The author, in the course of a brief reply, said he did not believe that developments in the electrical age would reduce employment; history showed that the use of machines increased the opportunities for employment. A reduction in the working week would probably lead to two- and three-shift working and so improve the load factor.

A vote of thanks to the author, proposed by Lord Citrine, was carried by acclamation.

ELECTRICAL EXPORTS

Mr. C. T. Melling (Electricity Council), opening the discussion on Mr. E. V. Small's paper on the future of electrical export, emphasised the need for the exporting industry not to be egocentric or "pre-Copernican." This country was not the centre of the world any longer and the first thing to consider was the customer and not the manufacturing plant. British manufacturers had shown that they realised this and had taken part in trade missions in every part of the world with great success. By their surveys of possibilities and the excellent staffs which they maintained in all parts of the world they had been able to examine and analyse the needs of their customers. Exports by the electrical industry had not, however, advanced very rapidly in recent years, having increased in total during the last two years by only 2 per cent.

There were many ways in which the organised home market, and in particular the electricity supply industry, could assist exports. It could do so by being progressive and not lagging behind world requirements; by being helpful in co-operating with and consulting the manufacturers; by being hospitable in receiving foreign visitors and showing them British-made plant under working conditions; by being generous in seconding experts to work in the under-developed countries; and by avoiding complacency. If the Americans were brought to realise that they must not always buy American, this country must realise that it could not always buy British. For some commodities there were too many independent manufacturing plants, and that applied from nuclear power stations to meters in the home. There was also the question of whether our plants were of the optimum size to get the best results from modern methods of manufacture.

Mr. J. F. Herbert (English Electric Co.) said the electrical manufacturing industry had never asked for special assistance in supporting its exports, but regard must be had to the facilities which foreign Governments made available to customers in the under-developed countries, for sooner or later this country would have to adopt similar techniques, even to some extent at the expense of the home market. To ask an overseas country to pay for a hydro-electric project over seven years when in this country the period would be 20-30 years placed an undue burden on newly-developing countries, and he suggested that the term of payment should be extended to 15 years for specified types of project. The need in the future for local manufacture had to be faced, and

this would enable products to be made to the requirements of the territory.

Mr. C. G. E. Parrott (B.E.A.M.A.) pointed out that before the last war, when Britain was the leading exporter of electrical goods, we exported goods to the value of £23 million. We had now slipped to third place, but with £285 million worth of exports. Not many years ago, 70-75 per cent of those exports went to the Commonwealth and Empire. The figure was now 65 per cent, but new markets had been found and in 1959 over £30 million of British electrical exports went to North America. We were now exporting to over 130 different territories. It was necessary to make a much more intensive study of markets than ever before and to combine selling and promotional activities for some of the lighter products. It might pay some of the smaller and more specialised companies to consider group contracting for durable consumer and lighter engineering products. There was much that the trade associations could do to help, and there might be discussions on non-



Mr. E. V. Small, joint managing director, A.E.I. Export, Ltd., and chairman, B.E.A.M.A. Export Panel, giving his paper on the future of electrical exports

competitive problems between representatives of trade associations internationally.

Mr. J. T. Grundy (Electric Lamp Industry Council) suggested that in some cases British standards might be too high to allow British manufacturers to meet Continental competition, and on the question of variety of demand mentioned that in the field of street lighting customers called for 128 different types of fluorescent lanterns in 90 different colours. The problem had been dealt with by a unitary system of 63 parts kept in stock for assembly.

Mr. W. H. Dixon (Merz & McLellan) said that the author had shown that there was no real antagonism between group contracting and the use of the services of consulting engineers. It did not seem essential to make a clear distinction between whether the services of consulting engineers should be put at the disposal of the contracting group or the customer; probably they should be divided so as to secure the best carrying into effect of the contract.

Mr. A. M. F. Palmer (Electrical Power Engineers' Association) contended that if there was insufficient Government support in the export field the industry was to some extent to blame, because it was not possible to ask for State help in one breath and attack State intervention in the next. If the community as a whole



Mr. T. E. Daniel, chairman of the North Western Electricity Board and past-chairman of E.D.A., and (right) the demonstration apparatus used to illustrate his paper

was to underwrite the export effort, which he thought would prove necessary, the community through Parliament must have a say in the way in which that effort was carried on. It might well be argued that there must be a sensible rationalisation of the export trade, including heavy electrical manufacture, if we were to compete with the streamlined economies of some other countries.

Mr. D. P. Sayers (C.E.G.B.) said it had been put to him by engineers from overseas that British manufacturers had been too inclined to offer the nearest British Standard rather than study what the market required.

Mr. J. A. Robbins (J. A. Crabtree & Co.), on the question of standardisation, referred to the experience of French manufacturers, who had only one customer on the supply side, Electricité de France, and who had been forced to make units which were unsaleable outside France. Unless care was exercised, that position might arise in this country. British exports might in some countries be unacceptable technically or unacceptable because the price was too high, and often the same thing caused both these troubles. Some countries kept out foreign goods not by tariffs but by the requirements of their testing stations. Care should be taken to see that British Standards were drafted in such a way as to help the export trade.

Mr. J. O. Knowles (Metal Industries, Ltd.) said that more and more the I.E.C. recommendations were being adopted by the under-developed countries as the basis for their standards. This made it all the more important for British technologists to take part in their discussion. British manufacturers must look forward to taking part with the nationals of under-developed countries in local manufacture or assembly, thus forming bases overseas which would be useful when exporting the products of higher technology.

Mr. J. B. Scott (Crompton Parkinson, Ltd.) called attention to the importance of the indirect exports of the electrical industry and said he had been told that the value of the electrical content of a complicated machine tool was greater than that of the mechanical part.

Lord Citrine (Electricity Council) said that whenever a new state was created or a territory acquired self-government it meant the creation of a further

international barrier to international co-operation by the development of nationalism. Self-government was followed by the desire for economic independence, which in turn involved quotas, tariffs and so on. He repudiated the assertion of the Herbert Committee that the electricity authorities in this country should not consider the national interest as a primary matter. The policy of the authorities had been one of co-operation with the manufacturers of heavy electrical plant, and they had hoped to find their way to a satisfactory agreement on prices to ensure a fair deal to both sides. He did not agree that combination among manufacturers must necessarily be contrary to the public interest, and he did not believe that the Restrictive Trade Practices Act would prove an unmixed blessing to this country.

The author replied to the discussion, and a vote of thanks to him was proposed by Mr. K. J. McKillop.

ELECTRICITY IN THE HOME

At the fifth session on 1st June Mr. T. E. Daniel presented his paper "The New Horizon—Electricity in the Home." The first speaker in the discussion was Mr. D. Bellamy (Yorkshire Electricity Board) who said that the idea of houses with a connected load of 100 kW seemed paradise to the commercial officer, a nightmare to the chief engineer and their *nunc dimittis* to those who had to provide the capital. Provision of the additional supply would cost about £30 per consumer—about £3 10s a year. This market was coming to the supply industry and they would meet it as they had met demands in the past. Thirty years ago as a young commercial officer he had received an order to supply on one estate 500 cookers and 500 wash boilers. Three years ago he had found that on a new housing estate in Yorkshire every house had a gas cooker. With freedom of choice the position was about equal. It would be wrong to put in inferior distribution systems with this demand in the offing, because he was sure that the industry would be able to meet all the demands made upon it.

Mr. W. J. Bird (General Electric Co., Ltd.) believed that the Domestic Division of the B.E.A.M.A. had gone a long way towards achieving the right sort of co-opera-

tion between manufacturers. In 1959 the reputable manufacturers in the industry made and sold over half-a-million electric cookers, 900,000 refrigerators and nearly 1½ million washing machines. This enabled the supply industry to sell about 1,500 million extra units. Taking the whole domestic electrical industry, it had extracted from the purchasing public £250-£300 million, contributing about £50 million in purchase tax and about the same amount to the retailing industry. Their aim was to extract £1,000 million a year from the public. Co-operation between manufacturers was achieved on the best basis, with no written agreement but with a wealth of understanding between the heads of industry. Abroad, they hoped to obtain agreement that approval of apparatus in this country would automatically entail approval everywhere in Europe on this side of the Iron Curtain. The home heating plan of the oil industry might be combated by an intensive study of the heating, cooling and movement of air in the home. There was need for a co-ordinated promotional attack on the domestic market by the whole electrical industry, in which E.D.A. could play a part.

Mr. S. J. Emerson (Senior Electrical Inspector of Factories) emphasised that electricity was the safest form of both industrial and domestic fuel. He welcomed Mr. Daniel's reference to a 25 A plug; of electrical accidents last year over half had been due to failures in plugs.

Mr. J. I. Bernard (director, E.D.A.) strongly supported the proposal that more active steps should be taken to promote storage heating in all-electric houses. In the long run it must be of great advantage to the supply industry to develop more night load in domestic premises. An ordinary three-bedroom house with slightly improved thermal insulation would require 10,000-15,000 kWh a year for heating, which would represent between two-thirds and three-quarters of the total load. It was possible to put 70-80 per cent of the heating consumption into thermal storage during the night. Manufacturers could not be expected, however, to develop storage heaters for domestic use with the present level of purchase tax.

Mr. A. C. Hazel thought that electrical people should be grateful to the oil industry for pointing out the very large market available in domestic heating. He had spoken to many research workers and experts in foreign countries and found they all agreed that the form of heating adopted should be flexible, should provide heat mainly in the form of low-temperature radiation, with some convection, should be safe, and should be able to deal with the problem presented by windows. On all those points electricity had advantages over other fuels.

Mr. H. R. J. Baigent (Southern Electricity Board) said he had recently compiled a list of applications of electricity in domestic and commercial premises and had found it interesting to compare this with the author's list. There were about eighty possible uses for electricity in the home. Mr. Baigent had missed three given by the author, but had given four not in the author's list, including an electrically-warmed toilet seat which was now on the market, and which he was sure would cause a few "headaches" to the installation inspectors. He felt that the rendering of bills quarterly might cause difficulty to weekly wage-earners, and it was disturbing to hear of tenants in floor-warmed all-electric flats introducing oil stoves. It was a pity that so much effort had

been put into telling housing authorities that an advantage of floor warming in multi-storey flats was that the tenant had sole control of the installation; control should rest with the landlord, because it would be beneficial to the building structure, be appreciated by the tenants and give a better load factor when used consistently and uniformly throughout the building.

Mr. J. K. Webb (I.E.E.) said that the research laboratories in which he worked had recently moved to new premises at Harlow, and the building, which had a floor area of about 100,000 sq ft, was heated by electric under-floor thermal storage, supplemented by a few convectors. The floor heating was rated at 15 W/sq ft of floor area and was switched on at 9 p.m. and off at 7.45 a.m. It was thermostatically controlled and if the surface attained a temperature of 68°F the current was switched off. The tariff worked out at about 0.6d/kWh, while during the day there was a charge of 1.6d/kWh for energy supplied to the convectors. The cost of thermal storage heating for an office room 15 by 12ft was less than 10s a week. He hoped there would be a greater adoption of off-peak thermal storage in domestic premises. If the Area Boards could offer small consumers energy during off-peak periods at ½d/kWh, many of them would be interested. For existing premises it would be interesting to examine electrically-heated carpet underlays and electrically-heated wallpaper, using printed circuits, and also portable thermal storage blocks and a smaller edition of the thermal storage tanks mentioned by Mr. Nelson.

Too Few Socket-Outlets

Mr. E. J. Sutton (National Inspection Council) referred with regret to the fact that a common factor in all domestic installations was the paucity of socket-outlets and the inadequate wiring of new houses. He was opposed to a 25 A socket-outlet, suggesting that anything in excess of 3 kW should be made a permanent connection to the fixed wiring.

Miss M. V. Griffith (Electrical Research Association) commented on the possibilities of latent heat storage if financial backing were provided. Forced ventilation would help to get the heat out of the cells, because the thermal conductivity was usually low. It had been suggested that what was needed was a lightweight storage medium to hang below the ceiling, but this might be a will o' the wisp unless some very odd material turned up, because it was necessary to have either weight or temperature difference to store heat in that way. Solar energy could be used for water heating to help out immersion heaters by preheating the feed water, or on some days could cope with the job alone. This had been done in a South London garden several years ago. There was a new small-capacity heat pump on the British market which had a solar absorber built into it.

Mr. J. W. Moule (South of Scotland Electricity Board) mentioned that in his area more than half the dwellings now being planned would incorporate under-floor heating. The existing house presented a very difficult problem. Although the heated underlay or heated carpet had many advantages it was not an off-peak load, and attention should be directed to developing systems of off-peak heating for existing houses.

The author replied briefly to the discussion, and a vote of thanks to him was proposed by Mr. J. R. Beard.



The panel at the Electrical Forum. Left to right : Mr. Norman Elliott, Mr. S. F. Steward, Miss Mary George and Mr. A. R. Cooper

Electrical Forum

AT the Electrical Forum, held on the last day of the Convention, the President acted as "question master" and the panel consisted of Miss Mary George, Mr. A. R. Cooper, Mr. N. Elliott and Mr. S. F. Steward.

To the question of how the load factor in the electricity supply industry compared with that of other industries, Mr. Cooper replied that the principal difference was that, unlike most other industries, the electricity supply industry could not store its commodity. The North Thames Gas Board had almost exactly the same load factor as the London Electricity Board, but had gasholders. Mr. Steward recalled the point made earlier by Mr. King that the 100 per cent load factor was a myth and that the performance of the industry should be judged by what was practicable. Taking this as 70 per cent, the figure of 46·50 per cent in fact achieved was not bad. There was much to be said for bad load factor loads at the right time, so that the real answer lay in diversity.

Safety of Appliances

Asked what more could be done to protect the consumer, Mr. Steward said one of the most important steps would be to get the Approvals Board for domestic appliances started and supported, as an independent body with full authority to test, approve and mark domestic appliances. One of the greatest remaining dangers was trailing flexes all over the house, and the provision of more outlets was necessary to prevent this. Miss Mary George emphasised the importance of educating the user, and in particular encouraging the teaching of electrical housecraft in the schools and getting the co-operation of the teachers. There would be a big job to be done in persuading the public to buy only appliances which bore the mark of the Approvals Board. Much more should be done to standardise plugs and sockets, and all new domestic premises should by law be required to be fitted with 13 A sockets. Mr. Cooper suggested the prohibition of the import of goods if the wiring did not follow the colour code, and it should be brought home to users that to buy cheap electrical equipment was the worst form

of economy. Mr. Elliott urged that any contractor or Electricity Board connecting a switch on the wrong side should be fined at least £10.

Mr. Elliott, dealing with the impact which solid-state devices, and particularly semiconductors, were likely to have on the generation and distribution of electricity, expressed the hope that they would replace switchgear for low and medium voltage, and in the long run for high voltage also. Switchgear was too much a mechanical engineering job. Mr. Cooper pointed out that the use of semiconductors for instrumentation and communications was growing in the supply industry. They were being developed for power purposes and might find a use for d.c. transmission in the years to come. Mr. Steward said that semiconductors were bound to re-establish the use of direct current and d.c. techniques in transmission and would have an effect on switchgear and perhaps on rotating machines. The silicon solar cell would have a profound effect, and perhaps in the end the solid-state appliance would abolish the generation of electricity. In the meantime these devices might rescue the trolley-bus by reducing the manpower, it being necessary only to have a driver and a semiconductor.

In the next question it was stated that, despite the inherent disadvantages of gas as a fuel, the national promotion of gas appliances continued to be formidable and effective. Were the counter-measures of the electrical industry adequate? Miss Mary George thought that the electrical industry had perhaps concentrated on the disadvantages of gas and should have more regard to what many people continued to think were its advantages, in that it was speedy and flexible for cooking on the hob and gave a continuous and instantaneous supply of hot water, as well as providing an excellent service and very good consumer relations. Electricity was rapidly catching up on gas in these respects, but much remained to be done. Every Board should send its housecraft advisers into the schools to see that where there were cookers with the old solid plates they were changed immediately and fast boiling plates substituted.

Mr. Elliott, while emphasising the need to bring down

the price of electricity, felt that competition between gas and electricity was good for both industries. Gas cookers would not be so good as they were today but for the competition of the electric cooker. Perhaps the publicity for electricity was not so good as that for gas, nor had electricity so good a slogan as "Mr. Therm burns to serve you." Mr. Cooper remarked that the best advertisement for gas cookers was the wife of an electrical engineer who used one. He thought that not enough use was made of the argument that everything cooked by gas was enveloped in the products of combustion. Mr. Steward suggested that it was because of rather than despite the disadvantages of gas that its promotion was so good; it had to be. The electrical industry had so good a product that they were only now beginning to sell it properly. It was necessary to spend more. He believed that the combined expenditure of E.D.A. and the Electricity Boards was about £500,000, whereas the combined expenditure of the Gas Council and the Gas Boards was about double that amount. On the other hand, the B.E.A.M.A. cooker manufacturers had spent about £440,000 in a year on Press publicity, which was more than double the amount spent by the gas cooker manufacturers. A joint effort by the whole industry was required.

The President urged that the right line in publicity was to emphasise the advantages of one's own product and not to run down the product of one's competitors. He thought that in the electrical industry too much was spent on advertising the brand and not enough on the advantages of the general range of products.

Cross-Channel Link

On the question of the advantages and effects of the electrical link with France, Mr. Cooper said that the cost of the connection was a little more than half the cost of the equivalent amount of generating plant and the savings due to the connection would be about £40 million a year. In the winter the British peak was in the evening and the French in the morning; the peak load day in this country tended to be Monday, and in France Tuesday or Wednesday. Half the generation in France was by water-power, and the French had a surplus which would otherwise run to waste. All over Europe electricity was sold from one country to another without tariff barriers, and the Channel link would allow this country to join in.

In another question the panel were asked for their views on the national electrical "quiz" organised by E.D.A. and the Townswomen's Guilds, and all the members regarded it as a great success and hoped that something on the same lines would be done regularly.

Asked whether there was any important future in the United Kingdom for the use of wind, tides or sunshine in generating electricity, Mr. Elliott said the sun gave to the earth each day about 10^{15} kWh of power, or about half the amount of energy in coal, oil and gas contained in the entire world. With solar cells having an efficiency of 15 per cent sunshine could be used to give a reasonable amount of power, but with the wind and tides he did not think there was much to be done. Mr. Cooper mentioned that there was a tidal scheme in the north of France which would have 38 9-MW sets, of which one was already working on a trial basis, and a scheme was projected in North America of 550 MW. An optimist in

this country was building a bungalow in which the whole roof would be a sun-trap to boil water and drive a generator. Startling advances might be made by the use of sunshine in conjunction with thermocouples; at present there were thousands of radio sets in Siberia operated by paraffin lamps which heated thermocouples.

Radio and Television Load

Another question concerned the character and importance of the load provided by radio and television sets, and to this Mr. Cooper replied that the effect could be considerable. When Tommy Farr fought Joe Louis in America so many people switched on their radio sets, and also coffee percolators, electric fires and so on, at 3 a.m. that the load went up by 400 MW, and when the Derby was televised the load went up by 250 MW. At the general election so many people wanted to hear the results that the load went up by 2,000 MW. They could rate Gracie Fields in megawatts.

Asked whether collaboration between firms would be of value in promoting exports, Mr. Steward expressed the belief that there was a tremendous potential extra export to be secured by the medium and smaller firms which had not previously entered the export market in a knowledgeable way owing to the nature of their resources. There was great scope for *ad hoc* co-operation on particular types of contract and more regular working together, and there should be a common intelligence service for the whole industry. The President remarked that so far as the export market was concerned he was willing to go gunning with anybody, "provided," he added, "that he does not shoot me in the back." He had gone gunning with many of his competitors and they had never attempted to do so. It was possible to have healthy competition at home and co-operate in attacking particular markets abroad, and in many instances, of which Portugal was one, this had worked very well.

ANNUAL DINNER

The annual dinner was held in the Pavilion, Bournemouth, on 1st June, with the President in the chair. The guest of honour was the Marquess of Salisbury, K.G., F.R.S., who, in proposing the toast of the "Electrical Industry," recalled that the Prime Minister, in a phrase already famous, had spoken of the wind of change which was blowing across Africa. It was not only across Africa that that wind was blowing; it was blowing a gale through all their lives. The world into which he and Lord Chandos had been born in 1893 was so completely different from that of today that it was almost impossible to believe that they had ever lived in it.

In 1893 electricity as a practical adjunct to life had been still in its infancy, and most people depended on gas or even on oil lamps. In his own home at Hatfield they had been more fortunate, for his grandfather had begun to install electricity in 1881. He had found in a drawer at Hatfield House some notes made by the house carpenter of that day which referred to the first attempt to use electric light, in 1874, when arc lamps had been used to illuminate the drive for a ball held in that year.

One of the most urgent problems for this country in the years immediately ahead, he said, would be how to produce all the electric power which would be needed to satisfy both industry and the private citizen. It

was probably only by the use of atomic energy for the production of electricity that this country could keep its place in the world as an industrial nation. If we could make the fullest use of the resources which science was placing at our disposal and avoid the catastrophe of another war, the outlook was bright indeed.

After the President had thanked Lord Salisbury for his speech, the toast of "Our Guests and Ladies" was proposed by Mr. C. R. King and responded to by Sir Alan Hitchman, of the Atomic Energy Authority.

ANNUAL MEETING

The Convention closed on 2nd June with the twelfth annual general meeting. The formal business having been transacted, the President proposed on behalf of the Council the election of the vice-president, Sir John Pickles, as President for the ensuing year. Sir John was unable to be present, his doctor having decided that he ought to spend another day or two in hospital. They all regretted his absence and sent him their best wishes for a speedy recovery from what they hoped was only a minor indisposition. The election was ratified by acclamation. Mr. W. H. McFadzean was elected vice-president and



Lord Chandos speaking at the annual general meeting



Sir John Hacking proposing the vote of thanks to the President

the President announced that the 1961 Power Convention would be held at Eastbourne from 12th to 15th June.

Sir John Hacking proposed a vote of thanks to Viscount Chandos for the delightful way in which he had presided over the Convention and for the efficient way in which he had occupied the chair at Council meetings. They all regretted Lady Chandos's inability on account of illness to be present at some of their meetings.

TELEVISION PROPOSALS

THE view that the 405-line system used for television transmission in this country with 5 Mc/s channel spacing will not be adequate for all purposes for the next twenty-five years and that 625-line standards (already used on the Continent) with 8 Mc/s channel spacing would give a worthwhile improvement in picture quality is expressed in the report of the Television Advisory Committee published last week.

The Committee report that colour television is not yet ready to be introduced into Britain, principally because of the complexity of the receiving equipment. They recommend that a decision on future monochrome line standards should precede the start of a colour service and that, if 625-line standards are adopted, colour when introduced should use the new line standards. It is made clear that further consideration has to be given to the other technical requirements for colour television.

Apart from technical advantages, the need for a change to higher line standards is bound up with the decision which the Government must take in the next few years on the whole future of television in this country. Mr. Bevins, the Postmaster General, said at a Press conference that if a decision to adopt 625-line was taken before 1962, the new system could be brought initially into limited service by 1964, but to cover the whole of Britain would take four or five years.

The report points out that because of insufficient frequency space it would be impracticable to adopt the 625-line standards if for any reason television is to be confined to Bands I and III, those at present used by the B.B.C. and I.T.A. A third 405-line programme with a coverage of 95 per cent of the population could, however, be accommodated. If more than three programmes are

envisioned then the ultra-high-frequency Bands IV and V will have to be used, and because a move to these bands will be the last opportunity of changing to a 625-line standard the committee recommend that in such circumstances it should be adopted.

Television in Bands IV and V would, however, be more expensive in terms of capital cost, since use of these bands would require four or five times the number of transmitting stations required in Bands I and III to give comparable coverage. Sets capable of receiving all four television bands will also cost more. Because of the undoubtedly advantages of Bands I and III for television the Radio Industry Council "feels strongly that any extension of television up to four national or near-national programmes should, if at all possible, be accommodated within Band I and an extended Band III" but "given the need to go into Bands IV and V, it is not opposed to the introduction of a 625-line system and would co-operate in bringing about any such changes that may be required."

The use of all the 8 Mc/s television channels in Bands IV and V would provide with either 405- or 625-line systems two programmes each with more than 98 per cent coverage or three programmes with about 95 per cent coverage. There should also be sufficient 8 Mc/s channels in Bands I and III—when after a period of some ten years the existing service has been superseded by the higher definition system—to accommodate two more 625-line programme networks with 95 or possibly 98 per cent coverage. Existing sets could not be adapted for 625 lines, and the Committee are careful to point out that any change in line standards would have to be spread over a number of years, so that there would be no question of 405-line receivers becoming prematurely obsolescent.

British Exhibition, New York

TO DAY (Friday), the Duke of Edinburgh is opening at the Coliseum, New York, an exhibition of British products which is the biggest foreign trade show ever to be staged in New York. The exhibition is jointly sponsored by the Dollar Exports Council and the Federation of British Industries, and is managed by British Overseas Fairs, Ltd., a private company founded and managed by the F.B.I.

The electrical manufacturing representation is a strong one, while on the radio side a comprehensive display has been arranged by the B.B.C. and the Audio Manufacturers' Group of the British Radio Equipment Manufacturers' Association. In the notes below we indicate some of the principal electrical exhibits, particulars of which have been sent to us by the manufacturers.

Associated Electrical Industries, Ltd., is displaying equipment including its electron microscope, telecommunications equipment, electro-medical equipment, marine radar, motors and control gear, and cables.

Among the exhibits of the Automatic Telephone & Electric Co., Ltd., are an electronic register translator for routing long-distance telephone calls, a transistorised and card-mounted carrier telephone channelling equipment, a transistorised buried repeater, and other telecommunications equipment.

The international nature of its activities is emphasised by British Insulated Callender's Cables, Ltd., and an enlarged reproduction of the B.I.C.C. *Bulletin* showing the front and back covers and four of the inside pages depicts a selection of interesting and varied contracts carried out by the group throughout the world. Products displayed include a sample of the 138 kV Vancouver submarine power cable and the 330 kV oil-filled cable for the Kariba hydro-electric scheme.

The work of most of its main departments is represented in the display by Ferranti, Ltd., including instruments, computer equipment, a coloured transparency of the "Orion" computer, electronic devices, aircraft equipment, and scale models of an impulse generator, a buried type distribution transformer, and a 60,000 kVA, 330 kV, three-phase power transformer.

The exhibit of the Morgan Crucible Co., Ltd., includes a working muffle type electric furnace, fitted with "Crusilite" silicon-carbide electric furnace elements, alumina oxide refractories, heavy duty resistors for high-voltage circuit-breakers and potentiometers for radio and electronic uses.

Newman Industries, Ltd., is showing every type of electric motor it exports to North America, ranging from $\frac{1}{2}$ to 600 h.p.

The display of lubricants arranged by Rocol, Ltd., includes special radiation-resisting lubricants which have been developed from experience of lubrication at Calder Hall and other nuclear power stations. Some of its food delivery vehicles are being shown by Smith's Delivery Vehicles, Ltd.

The display by Standard Telephones & Cables, Ltd., includes a completely transistorised digital computer,

having the logical design and programming characteristics of the "Stantec Zebra" computer. There is also a comprehensive display of components for the telecommunications and electronics industries. A new high-performance teleprinter is being shown by Creed & Co., Ltd.

The exhibit of Submarine Cables, Ltd. (owned jointly by the A.E.I. and B.I.C.C.) is intended to demonstrate that the company is in a position to handle complete submarine cable systems comprising the terminal equipment, submarine cable and repeaters, and cable laying. The main feature of the display is a submerged repeater of the type inserted in submarine cables at about 20-mile intervals on the bottom of the sea.

All the activities of the steel, aluminium, engineering and allied home companies in the Tube Investments Group are represented in the Group's display arranged by the export sales organisation, TI (Export), Ltd.

The Engineering Centre, Birmingham, has a composite display which has been designed for the small-and medium-sized engineering companies and includes the products of the following manufacturers:—Amal, Ltd.; Belliss & Morcom, Ltd.; Delta Metal Co., Ltd.; Electromagnets, Ltd.; Finlay Engineering, Ltd.; the Harland Engineering Co., Ltd.; George H. Hughes, Ltd.; the Mirrlees Watson Co., Ltd.; the Morgan Crucible Co., Ltd.; Morleys (Birmingham), Ltd.; S. E. Opperman, Ltd.; Platt Metals, Ltd.; A. G. Thornton, Ltd.; and the Triangle Valve Co., Ltd.

The Audio Manufacturers' Group of B.R.E.M.A. has staged a group exhibit of audio, radio and television equipment on behalf of Beam-Echo, Ltd.; Brenell Engineering Co., Ltd.; Bush Radio, Ltd.; Clarke & Smith Manufacturing Co., Ltd.; Ferguson Radio Corporation, Ltd.; Gramophone Co., Ltd.; Lowther Manufacturing Co., Ltd.; and Truvox, Ltd.

Other exhibitors include Richardsons, Westgarth & Co., Ltd., the M.O. Valve Co., Ltd., the Metal Industries group of companies and the Joseph Lucas companies.

All the fluorescent batten fittings for lighting the exhibition were supplied by Courtney, Pope (Electrical), Ltd., who also supplied a large number of decorative fluorescent fittings and tungsten fittings. The electrical contractors for the exhibition were James Kilpatrick & Sons, Ltd.

New Semiconductor Devices

A DISCUSSION on "New Semiconductor Devices and their Possible Applications" was held by the Electronics and Communications Section of the Institution of Electrical Engineers on 25th May and was opened by Dr. A. F. Gibson and Mr. G. King. Dr. Gibson described Esaki or tunnel diodes, the field-effect gyrator, p-n junction cathodes, negative-mass amplifiers and applications of cyclotron resonance, and brought out more particularly the physics of the devices. Mr. King indicated a few of the things which could now be achieved with some of the newer components, such as Esaki diodes, variable-capacitance diodes, thermo-electric coolers, etc.

E.T.U. Conference Resolutions

FOLLOWING the line of Mr. F. Foulkes' presidential address, one of the first resolutions passed at the annual conference of the Electrical Trades Union at Hastings last week declared that there was every justification for greatly improved wage rates in the electricity supply industry. It asked the conference to pledge active support to improve wage rates. An amendment sought to add a demand for the removal of Clause 20 of the National Agreement which provides for arbitration as the final stage of negotiations. This was opposed by the Executive Council. Mr. Foulkes, called upon to make a statement, said that the present wage claim was going to arbitration and the trade union side of the N.J.I.C. would abide by the arbitrator's decision. The amendment was withdrawn and the original resolution carried.

A further supply motion accepted by the delegates expressed grave concern at "the ever-increasing practice of engaging private contractors to carry out work which is solely the prerogative of members of the supply industry."

Tuesday morning and part of Tuesday afternoon were given over to contracting matters. A motion from London Station Engineers 20 branch expressing dissatisfaction at the payment of "abnormal conditions" money and urging the Executive Council to make a claim for a minimum of 5s a day, was carried. Mr. R. G. McLennan, assistant general secretary, gave an account of the Union's unsuccessful efforts to vary Clause 8 of the National Working Rules to provide for "plus" payments. He told of the recent protracted negotiations, following the report of the Committee of Investigation, which had resulted only in a temporary agreement.

Peckham branch's motion linked a request for day release of apprentices with a demand for an increase in the rates of pay for apprentices of 15 per cent at the ages of 15, 16, 17 and 18, and 10 per cent at the ages of 19 and 20. The motion was referred to the Executive Council.

Once again there was pressure for the introduction of a sick pay scheme in the electrical contracting industry, with a request that negotiations should be expedited. Such a scheme has been a recurring item on the agendas of the N.J.I.C. for a number of years. The Executive Council had modified its original claim for a non-contributory scheme to a contributory one. Negotiations with the N.F.E.A. are continuing, the N.F.E.A. having agreed to examine the matter further.

Travelling Time and Fares

On site recruited labour, conference referred to the Executive Council a motion that the National Working Rules should be revised on similar lines to the electricity supply agreement. A further motion on travelling time was also referred to the Executive Council. Sponsored by Edinburgh Central branch, the motion pressed for the abolition of the present allowances and the substitution of the principle that travelling time should be met in full by the employers, with time to be paid from three miles up to 25 miles from the established place of business.

In the afternoon, however, conference carried a similar motion on travelling time and fares. This called for the deletion of the words in the National Working Rules "with the exception of those operating in London, Manchester and District, Mersey District," so that "the principle of complete parity" should operate throughout the industry.

An amended motion called on the Executive Council and members in the electrical contracting industry to take action to achieve a ratio of one apprentice to five journeymen. Approval was also given to the Liverpool Supervisory branch's motion that a standard rate or salary should be

established for members employed in a supervisory or foreman's capacity in the electrical contracting industry. A composite motion was carried that the Executive Council should press immediately to abolish the gap between earnings and wage rates in the calculation of annual holiday pay, so that two weeks' full pay should be the amount the employer would have to pay.

The Executive Council was later called upon to make a claim to the N.F.E.A. "at the earliest possible moment" for three weeks' holiday with full pay.

Although a 42-hour week was agreed at the beginning of the year in the electricity supply industry, Camden Town branch's motion, "to conduct a campaign throughout the industry for industrial action" to secure a 40-hour week was carried overwhelmingly.

On engineering wages, conference carried a resolution which called upon the Executive Council to press for a substantial increase in minimum basic rates.

Conference welcomed the Crowther Report and requested the Executive Council to review apprenticeship agreements on the basis of the report.

T.U.C. General Council Criticised

At the final session of the conference it was decided to table a motion at the September Trades Union Congress calling for the setting up of a committee of rank and file members to investigate the conduct of the General Council. The resolution criticised the conduct of the General Council in starting an inquiry into strikes, in its interference with the affairs of the E.T.U., and its lack of defence of the bus strike and the printing workers' strike. It also criticised the Council's inadequate support for victimised trade unionists and in developing a campaign for the 40-hour week.

Electronic Equipment Reliability

A SYMPOSIUM organised by the Institution of Electrical Engineers on the reliability of electronic equipment, with particular reference to field experience and methods of assessing and predicting reliability, was held recently at the Institution of Civil Engineers. After an introductory survey by Mr. R. Brewer, the first session, "Users' Requirements and Problems," was held under the chairmanship of Mr. L. I. Farren. The introduction to the session was given by the rapporteur, Mr. R. J. Halsey, based on a number of contributions, which included an appraisal of operational reliability in electronic systems, a description of the collection of fault data on transmission equipment, users' requirements and problems in connection with electronic telephone exchanges, the reliability requirements of electronic equipment in civil aviation, and the inadequacy of present-day component specifications and ratings for large-scale computers.

The second session in the afternoon dealt with problems of system design and manufacture. The chairman was Mr. E. P. Fairbairn, and the rapporteur, Mr. L. Knight, based his introduction on contributions dealing with such aspects as preventive maintenance in digital electronic equipment, designing reliable electronic switching equipment, factors influencing system reliability and the design of reliable systems for submarine cables. The third and final session in the evening was devoted to problems in the design and manufacture of component parts, the chairman being Mr. C. G. Garton and the rapporteur Mr. G. W. A. Dummer. The contributions received for this session included those considering some facts about semiconductors, production aspects of the reliability of printed circuits, reliable contacts and relays and some problems in assessing resistor failure rates.

GENERATION AND DEVELOPMENT

West Riding Power Station Sites

Six areas in the West Riding of Yorkshire are being investigated by the Central Electricity Generating Board to explore their suitability for large coal-fired stations. Two of the sites adjoin the existing Ferrybridge station and the new station under construction at Thorpe Marsh, near Doncaster; the others are at Knottingley, Kellingley, Eggborough and Gowdall, near the course of the River Aire between Knottingley and Goole. The investigations are expected to take several months to complete.

New Scottish Station?

A 1,200 MW coal-fired power station costing £50 million may be built by the South of Scotland Electricity Board. One of the sites considered is at Preston Links, near Cockenzie, East Lothian. A spokesman for the Board said on 24th May that the project was as yet only in a preliminary stage; they were looking ahead to 1967-68 when a new station would be needed. He pointed out that the Kincardine station had still to be brought into full operation and the Hunterston nuclear station had to be commissioned.

Floor Warming in Manchester

Reporting on heating arrangements in maisonettes and houses being built as the second stage of the redevelopment of the Miles Platting clearance area, Manchester Housing Committee says solid fuel appliances are being omitted. In each dwelling space heating in the living room and hall will be by electric floor warming, which will be

in operation for 30 weeks in the year. An electric wall fire will be provided for use in the summer months or at any time that extra heat is required. Tenants will be able to choose between gas and electricity for cooking. The estimated charge where cooking is done by electricity is 17s 6d per week, of which 8s 6d is in respect of floor heating and 9s 1d for all other purposes.

Electricity Supply Careers

The Education and Training Branch of the Electricity Council has produced a handbook with the title "Careers in Electricity Supply for Clerical, Administrative and Sales and Service Staff." Copies of the handbook, and further information, can be obtained on application to the Education and Training Officer, Electricity Council, Winsley Street, London, W.I.

Condensers for Supergrid

Two 40 MVA synchronous condensers, the largest ever ordered by the C.E.G.B., are to be supplied by Associated Electrical Industries, Ltd. (Heavy Plant Division), for the Board's substation at Iver, Bucks. The order includes auto-transformers for starting, automatic voltage regulators of the magnetic amplifier type, and push-button starting equipment. The condensers, which will be connected to the supergrid by means of the tertiary winding of a 275/66/11 kV transformer, are designed to work at their nominal rating over a range of 11 to 13.2 kV. They will run in water-cooled bearings at a speed of 1,000

r.p.m. Water-cooled air-coolers and an air-blast water-cooler will be used for ventilation. Since each machine will be totally-enclosed, it will be suitable for outdoor use, and although the total weight will be approximately 110 tons, erection and maintenance can be carried out without a heavy crane.

Service Centres in the East Midlands

Since 1953, when the East Midlands Electricity Board last reported on the service centre facilities in its area, eight additional centres have been opened—at Sutton-in-Ashfield, Beeston, Bakewell, South Wigston, Swadlincote, Kenilworth, Warwick and Walsgrave Road, Coventry. New service centres have been opened in place of existing centres at Coventry, Nottingham, Coalville, Corby and Grantham; premises at High Street, Lincoln, have been purchased for conversion as a service centre, replacing the present premises at Silver Street; and at Retford the Board is to lease one of the new shop premises to be constructed in Carol Gate, which will take the place of the existing service centre at Bridgegate. Improvements have been carried out at the service centres at Derby, Chesterfield, Rugby, Wellingborough, and Tamworth, to make them more spacious and attractive, and improvements are in hand at Brackley.

In presenting this report to the Electricity Consultative Council last week Mr. T. G. Blayney, chief commercial officer of the Board, said that



General view of the site of the Latina nuclear power station in Italy. At the left centre of the photograph can be seen the third boiler and the pressure vessel welding area. Beneath the Goliath crane is the second boiler which is being cleaned internally. The structure for the reactor and the turbine house can also be seen. The Nuclear Power Plant Co. is responsible for the overall design of the station

a general review of the need for new service centres in the Area as a whole indicated that the localities which probably deserved the highest priority were Bulwell, Hucknall, Sherwood, West Bridgford, Alfreton, Hleanor, Ashby-de-la-Zouch and Bedworth. In the case of West Bridgford, the Board had already agreed to lease new shop premises under construction on the site of the old Tudor Cinema, where it was hoped to open a service centre later this year.

Power from Peat

The Irish Electricity Supply Board's new milled-peat-fired generating station at Rhode, Co. Offaly, has recently been put into operation. Its present capacity is 40 MW and work

has begun on additional buildings and plant to double this output by 1963. The Board's plans for meeting the continuing growth in demand for electricity include another milled peat power station at Bellacorick, Co. Mayo, due for opening in 1963, and an additional 30 MW set at Ferbane which will thus become the biggest station in the country using milled peat.

Street Lighting Plans

Bedlington U.D.C. is applying for permission to borrow £22,075 for street lighting at Nethererton Lane, Bomarsund Road, and the approaches to the new Kitty Brewster Bridge.

Birkenhead Works and Buildings Committee has approved street lighting proposals for 1960-61 estimated to cost £12,120.

Colwyn Bay Council is seeking permission to borrow £31,600 to cover the cost of converting the street lighting in the central area of the town from gas to electricity.

Durham City Council is to spend £4,090 on improving street lighting.

Lambeth Corporation is recommended to approve a scheme, estimated to cost £32,920, for the conversion of street lighting in the Herne Hill, Lansdowne and Springfield Wards.

The improvement of the street lighting in eleven roads at **Leicester** is estimated to cost £25,354.

Maidstone Works Committee recommends that various roads in the borough should be re-lit during the financial year 1960-61 at an estimated cost of £21,000.

Newcastle-on-Tyne City Council has received sanction to borrow £59,632 for the fifth stage of its scheme for converting street lighting from gas to electricity.

All roads in the **Saltburn and Marske** area (Yorks.) are to be lit by electricity instead of gas. The cost of the change-over will be in the region of £25,000.

Stockton-on-Tees Town Council has approved proposed public street lighting schemes to cost over £120,000. The work is to be spread over a number of years.

New TV Studio

THE new Studio 5 of Associated Rediffusion at Wembley was used for the first time for the production of "An Arabian Night." The new set, which is the largest in the world, has a production area of 14,000 sq ft, being 140ft long by 100ft wide by 40ft high. The studio can be partitioned by a soundproof double door weighing 50 tons which will divide the studio into two equal sections. This door was supplied by George W. King, Ltd. Studio 5 has cost £1 million.

The studio is equipped with eight new E.M.I. 4½in image "Orthicon" cameras, the tubes for which were developed, manufactured and supplied by the English Electric Valve Co., Ltd.

The vision systems can be operated at 405, 525 and 625 line frequencies. Each of the two vision control rooms has fourteen 21in picture monitors to allow the monitoring of ten sources of vision to transmission, off-air and two previews. The sound equipment has been specially designed and has 26 low level channels and one high level, divided into four groups. All controls and faders are mounted on a sloping panel on a sound console to facilitate operation.

Power for studio lighting and ancillary services is supplied from 750 kVA transformers. Five hundred kVA is provided to two lighting patch panels so arranged that the whole

supply can feed one patch panel. The services for the camera control rooms can be supplied with a 60 c/s supply when using the 525 line operation.

The lighting system has a total of 340 single-phase circuits for each half of the studio and 120 of these circuits are controllable from each of the two control consoles. One hundred circuits are provided with 5 kW transformer dimmers and 20 are contactor controlled. The electrical installation and special studio lighting were carried out by the Strand Electric & Engineering Co., Ltd. The main contractors were Bovis, Ltd., and the architects Messrs. Farms & Partners.

(Below) General view of Studio 5, which is the largest TV studio in the world

(Right) Part of the sound control room



PARLIAMENTARY REPORT

New Public Accountability Proposals

As a result of pressure from the back benches the Government are to make new proposals which will enable the House of Commons to have advance information about the investment programmes and the borrowings of nationalised industries. Making the announcement during a debate on the Finance Bill, the Chancellor of the Exchequer, Mr. Amory, said it was expected that the new proposals would be made by the autumn.

He was replying to an amendment moved by Mr. Nabarro which would have reduced from £2,050 million to £2,007 million the aggregate of sums for the capital investment programmes for the year ending 31st August, 1961, of the seven nationalised industries. Mr. Nabarro's purpose was to bring within the ambit of the Finance Bill individual accountability for each industry each year before the money was spent.

The Chancellor had proposed to increase the sum of Exchequer advances by £430 million and originally he had said he would take powers for three years without any annual scrutiny by the House, but when the Finance Bill was published he had conceded a point and provided for an annual scrutiny of the sums involved. Unfortunately there remained one aggregate sum for all seven nationalised industries. Members were not able to debate the programme of an individual industry and to decide, as just one example, in the case of Scottish electricity, whether it would not be more economical to invest in nuclear power stations in the south of Scotland instead of water or hydro-electric works in the far north.

No programmes were published for any of the seven industries. No member knew what power stations were to be built, or whether they were to be water or wind or nuclear or steam stations in the north of Scotland or elsewhere. How could the Chancellor with any truthfulness say that Parliament was properly scrutinising the sums being voted for these industries? Mr. Nabarro said his ultimate objective was a separate Capital Investment (Nationalised Industries) Bill, with one clause for each industry, specifying how the money was to be spent. Two Conservative members, Mr. Peyton and Viscount Hinchingbrooke, supported the appeal for new accountability.

Mr. Amory said Parliament was entitled to be interested in the invest-

ment programmes and in the individual and total sums to be spent by nationalised industries. These investment programmes were likely to be available in the autumn and the estimates of what would be needed to meet the programmes by February.

In view of the representations made from the House the Government were examining these matters urgently and expected that by autumn they would be able to make new proposals for the handling of these matters in the future on some satisfactory basis, including the supplying to the House of information which they could examine and debate, both on the annual investment programme of each industry and on the estimated amounts that each industry would require to borrow from the Exchequer for the coming year. The essential thing, if the Government

were to meet the wishes of members, was that this information should be available to the House for examination before the programme was put into operation.

Evidence on Consumer Protection

Among the organisations which have given written evidence to the Committee on Consumer Protection are the Electricity Council and the Portable Electric Tool Manufacturers' Association, said Mr. Rodgers, Parliamentary Secretary to the Board of Trade. Asked if he would publish the evidence he said it was up to the Committee to decide on that, but up to date the Committee had made no objection to organisations publishing their own evidence if they wished to do so.

Domestic Appliance Production

There was a general fall in manufacturers' deliveries of domestic electrical appliances during the first three months of this year compared with the last quarter of 1959, which included the pre-Christmas build-up of stocks. This is shown by latest statistics issued by the British Electrical and Allied Manufacturers' Association and set out in the table.

Refrigerators were a notable exception, the total number of domestic electric types delivered during the first quarter of 1960 being some 115,500 above the total for the previous quarter. In addition, 63,000 foreign

refrigerators were imported into the country during this period, mainly from Western Germany, Sweden and France.

The new statistics have now been collected for sufficiently long for some interesting trends to emerge. For example, combined washing/spin-drying machines are steadily accounting for a higher proportion of total washing machine deliveries to the home market. In the last three quarterly periods covered by the returns their share of total deliveries has been respectively 35 per cent, 42 per cent and 46 per cent.

DOMESTIC ELECTRICAL APPLIANCE DELIVERIES IN FIRST QUARTER, 1960

Appliance	Home Market		For Export	
	Quantity (000's)	Value (£000's)	Quantity (000's)	Value (£000's)
Blankets ...	230	594	0.9	2.2
Cookers, domestic types:				
(a) below 5 kW	28	313	1.8	17.7
(b) 5 to 12 kW	112	3,938	3.1	88.8
Dishwashers ...	2	113	0.4	17.5
Floor polishers and scrubbers ...	5	66	13.6	120.7
Hand hair dryers ...	62	115	16.7	29.6
Irons (a) non-automatic	40	24	12.3	8.4
(b) automatic	358	665	114.5	172.8
Dry shavers ...	135	494	n.a.	n.a.
Space heaters up to 3 kW	696	2,207	18.6	66.7
Spin dryers ...	35	644	8.6	113.0
Heated tumble driers ...	12	367	0.4	10.3
Toasters ...	44	139	14.1	45.7
Food and drink mixers up to 3 quarts capacity including all hand held ...	22	275	17.3	232.2
Refrigerators* ...	234	n.a.	21.9	n.a.
Vacuum cleaners ...	312	4,392	45.5	410.5
Washing machines with electrically driven means of agitation:				
(a) with hand or power wringers	122	4,476	16.3	419.5
(b) combined with a spin dryer	105	5,544	25.8	833.5
Water heaters:				
(a) immersion (up to 3 kW)	140	217	3.5	5.9
(b) storage (up to 30 gal.)	40	432	3.7	54.2
Washboilers (up to 10 gal.) ...	45	313	0.8	6.0

* Supplied by the Domestic Refrigeration Development Committee.

n.a. = not available.

INDUSTRIAL NEWS

Mining Equipment Export Association

A Press conference was held in London last week at which the object and aims of a new association—the British Mining Equipment Export Association—were explained by Mr. C. R. C. Burton (a director of International Combustion (Export), Ltd.), who is chairman of the Association. He emphasised the need for concerted action to boost export sales of British mining machinery and stressed the necessity to Government, financial and manufacturing interests that British consultancy "know-how" should be made available at a competitive cost and at the earliest stages of all new exploration and mining projects. The Association had been formed to speak with one voice for the industry as a whole and to obtain market intelligence from overseas.

The Association was mooted in July, 1959, by ten founder members with the following objectives:—To tackle problems *vis-à-vis* Government and financial agencies at home and overseas, and to provide facilities for collective market intelligence and sales promotion effort. Membership now stands at thirty-three and the Association has been formally constituted. The hon. secretary is Mr. J. W. Law, and the address of the Association is Boundary House, 7-17, Jewry Street, London, E.C.3 (telephone: Royal 0141).

Durgapur Steelworks

The first 12in blooms have been rolled on the 32in intermediate mill in the new steelworks at Durgapur. The electrical equipment for the continuous billet mill was expected to be installed and ready for the mill to start production by the end of May. The electrical plant for both mills has been supplied by the English Electric Co., Ltd. In full production the two mills are capable of reducing 1½ million tons of 12in by 12in bloom to 2in square billets.

The main plant for the intermediate mill is a 4,500 h.p. single armature, reversing d.c. motor, running over a speed range of 80 r.p.m. to 120 r.p.m. and with a peak output of 11,250 h.p. Power is supplied to the motor by two generators connected in series and driven by a 6,100 h.p. synchronous motor.

The continuous billet mill has a total of eight stands to pass each bloom through eight sets of rolls before it is reduced to a 2in square billet. Stands

1 and 2 are each driven by an 800 h.p. d.c. motor and stands 3 and 4 each by a 1,000 h.p. d.c. motor. Stands 5, 6, 7 and 8 are driven through a common gear box by a 7,000 h.p. synchronous motor which also drives the generators to supply the four d.c. motors on stands 1 to 4.

In addition to all the electrical equipment for these two mills, English Electric has supplied a range of motors from ¼ h.p. for gas valves to 550 h.p. machines driving the hammer mills.

Furnace for India

A contract has recently been placed with Birlec-Efco (Melting), Ltd., by Electro Metallurgical Works Private, Ltd., for a special direct arc melting furnace. It is to be installed at Dandeli, State of Mysore, India. The furnace, arranged for 90° nose tilt, will be hydraulically tilted. Rated at 1,200 kVA, the plant will be used for the production of ferro-manganese, some of which will be supplied to the new Durgapur steelworks for use in the production of special steels. The value of the contract is about £40,000.

Germanium Rectifier for Chlorine Production

A germanium power rectifier plant for chlorine production supplying 20,000 A at 140 V will soon be commissioned in South Africa, to operate in parallel with other converting equipment. It will be supplied by the Heavy Plant Division of Associated Electrical Industries, Ltd., and installed at the Umbogintwini (Natal) Chlorine Works of African Explosives & Chemical Industries, Ltd. The equipment will be controlled by one voltage regulating unit supplying a rectifier transformer, the load current being controlled by varying the d.c. voltage manually or automatically between 140 and 90. A series-parallel connection in the

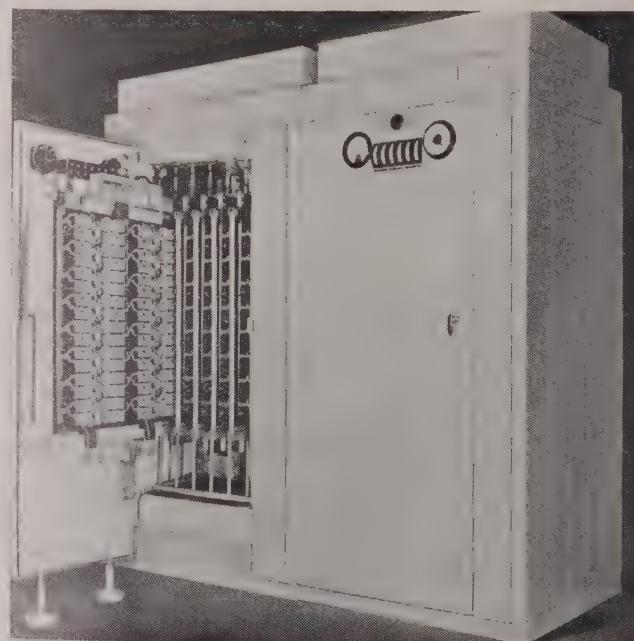
The A.E.I. germanium rectifier for chlorine production consists of two cubicles each rated at 1·4 MW, 10,000 A, 140 V

transformer winding allows the equipment to be used between 70 and 45 V d.c.

Each of the two rectifier cubicles is rated at 1·4 MW and has closed air-circuit cooling and a built-in air-water heat-exchanger. The cubicles contain six-phase double-star-connected rectifier cells with parallel path protection fuses and transformers for the fuse rupture indication circuit. A combined fan and motor is mounted in the top of the cubicle, and a fan-failure relay in the airstream is interlocked to trip the a.c. circuit-breaker, as is a cooling water-flow failure relay. On the front of the cubicle are mounted an ammeter and an indicating thermometer provided with alarm contacts. Between these two meters are six instruments giving visual indication of fuse rupture. The output from each rectifier cubicle to the main busbar is via a single-pole air circuit-breaker having over- and reverse-current trips. Instantaneous and inverse time protection are provided on the a.c. circuit-breaker, operating from current transformers on the secondary side of the rectifier transformer. The calculated efficiency of the rectifier is 98·8 per cent and the overall efficiency 95·8 per cent at full load. The power factor at full load is 0·92, which is corrected to unity by capacitors.

Plant for New Liner

W. H. Allen, Sons & Co., Ltd., Bedford, have received an order from the Parsons Marine Turbine Co., Ltd., for three 1,500 kW pass-out condens-



ing turbo-alternators for the new Shaw Savill passenger liner, s.s. *Northern Star*, which will be similar to, and will operate in conjunction with, the s.s. *Southern Cross*. Each set will operate with steam at 560 p.s.i.g. and 890°F, exhausting at 28·5 in Hg, and will be capable of passing out 15,000 lb/hr of steam at 145 p.s.i.g. Each turbine will run at 6,250 r.p.m. and will drive through epicyclic gearing, a closed-air circuit, water-cooled, Allen self-regulating alternator at a speed of 1,800 r.p.m. The main machinery will be constructed by the Parsons Marine Turbine Co. and the hull by Vickers-Armstrongs (Shipbuilders), Ltd., Newcastle.

Atomic Terms Glossary

A new edition of the United Kingdom Atomic Energy Authority's "Glossary of Atomic Terms" has now been issued, available from H.M. Stationery Office, price 3s 6d. It lists and explains in simple, concise language some 500 terms in common use in connection with nuclear matters. The definitions range from "Absorber"—matter which absorbs atomic rays and particles . . . through "Fission Yield" and "Proton" to "Zeta" (zero energy thermonuclear apparatus) the equipment used at Harwell for research into possible fusion reactions and various aspects of plasma physics.

Smelting Company's Bi-Centenary

The Sheffield Smelting Co., Ltd., is celebrating its bi-centenary in June this year. The company was founded by John Read in 1760, who set up in business, in his own name, as a refiner. The company was incorporated in 1890 and its Royds Mill was the first in England to install plant for the refining of silver by electrolysis. The traditional activities have been greatly expanded and new ones added, including the production of non-ferrous ingots.

Building and Civil Engineering Buyers' Guide

The 1960 edition of "Sell's Building and Civil Engineering Trades List" (incorporating "Sell's Building Trades List") has recently been published by Business Dictionaries, Ltd., St. Dunstan's House, 133-137, Fetter Lane, Fleet Street, London, E.C.4, price 40s. The volume contains over 40,000 names and addresses of firms engaged in the manufacture, supply and distribution of materials for the construction, equipment and maintenance of every type of building, classified under 2,700 descriptive trade headings. The names, addresses and secretaries of

over 600 associations, federations and other organisations concerned with the building trade are included and a new products review has been introduced.

Clean Air Year Book

Many facts about air pollution and the campaign for its prevention are contained in the Clean Air Year Book, 1960, published by the National Society for Clean Air, Palace Chambers, Bridge Street, London, S.W.1, at 2s (2s 4d post free). Useful digests of information about the Clean Air Act and its regulations are given and there is a list of local authorities which have smoke control areas or smokeless zones in operation or approved. Other features of interest are a chronological history of the struggle against air pollution—beginning in 1273—a bibliography of publications, a selected list of recent papers, and a directory of interested organisations, including a separate section for overseas organisations. The Society's annual report for 1959 is included.

Order for Steelworks Plant

Dewhurst & Partner, Ltd., has received an order from Richard Thomas & Baldwins, Ltd., for the supply of individual motor starters and contactor pattern lighting control panels for the Spencer Works at Newport, Mon. The individual motor starters cover ranges up to 90 h.p., and the lighting control panels will include latched pattern contactors in various sizes up to 300 A.

Industry in Scotland

With the view of attracting industry to Scotland, the North of Scotland Hydro-Electric Board has issued an illustrated booklet setting out the conditions and opportunities for industrialists which exist in the North of Scotland. It includes messages from the number of leaders in the electrical industry whose companies have established factories in the north, expressing their satisfaction at the high standard of workmanship and adaptability of the people and conditions generally.

Airliner Galley Equipment

Introduced on the London-New York route on 27th May, B.O.A.C.'s new Rolls-Royce-engined Boeing 707s—the world's biggest and fastest jet airliners—carry 129 passengers, plus crew, all of whom are served with two meals during a flight. These meals are prepared in galley equipment supplied by the General Electric Co., Ltd., of England, under a contract worth over £20,000.

Each of the fifteen airliners has been fitted with two galleys, and in each



G.E.C. galley equipment aboard the new B.O.A.C. Boeing 707 airliner

there are two air-circulation ovens, three hot beverage containers and two hotcups. Each oven is capable of heating up to 32 complete pre-cooked frozen food meals in 18 to 20 minutes. A time-switch that can be set to predetermined periods sounds a buzzer to warn the steward when the food is ready. This, the G.E.C.'s first high-voltage a.c. aircraft oven, uses 200 V 400 c/s for the motor driving the fan and 115 V for the heating elements.

Instrument Contract

Avo, Ltd., a company in the Metal Industries group, has received a contract from the United Kingdom Atomic Energy Authority to supply a quantity of Avo hot spot monitors. These instruments are used for measuring beta, gamma and X-radiation.

Electronics Exhibition

The annual Electronics and Instruments Exhibition and Convention, organised by the Northern Division of the Institution of Electronics, will be held from 7th to 13th July at the Manchester College of Science and Technology.

British Instruments Guide

The second edition of "British Instruments," a comprehensive list of British scientific instrument manufacturers and their products, has been published by the United Science Press, Ltd., under the authority of the Scientific Instrument Manufacturers' Association of Great Britain, S.I.M.A. House, 20, Queen Anne Street, London, W.1, price £2 5s, post free. This 625-page guide contains sections on the associations allied to the instrument industry; B.S. specifications for scientific instruments and components; an enlarged list of consultants, engineers and installers of instrumentation

schemes; and firms able to carry out development work and manufacture prototypes or small batches of instruments. There are also glossaries in French, German and Spanish.

Britain to Consider Joining Euratom

"The British Government, without regard to all that has happened in the last few years, will certainly be ready to consider anew the proposal that Britain should join Euratom and indeed the European Coal and Steel Community as well." This was stated last week by Mr. John Profumo, Minister of State for Foreign Affairs, to the Assembly of Western European Union meeting in Paris.

He was speaking after M. Arthur Conte (France) had introduced a report (later unanimously adopted) recommending that the Governments of the seven member states of W.E.U. should examine the possibility of Britain becoming a full member of Euratom. Speakers from all the six Common Market countries made it clear that Britain would be welcome in Euratom.

Mr. Profumo qualified his statement by saying that Britain would have to know whether she was welcome, and also in a matter which had not only technical but political significance, what the effect would be on the immediate situation. Any decision "must be taken with full regard to the loyalties that we have towards our partners in the European Free Trade Association."

M. Conte said that there was little time left. Within a few months the institution would have been set going, officials would have been appointed, and industrialists would have adjusted themselves.

Semiconductor Rectifier Voltage Surges

A report on the suppression of switching surges under various conditions has been produced by the Electronic Apparatus Division of the A.E.I. Valve and Semiconductor Sales Department, Carholme Road, Lincoln, from whom copies can be obtained on request. The report (Ref. EAD.8011) is intended for those who are faced with the problem of voltage surge effects on semiconductor rectifiers.

E.R.A. House Journal

The ninth issue of the Electrical Research Association's house journal *Co-operative Electrical Research* contains articles on contactor research, air-blast circuit-breakers and the preservation of wood poles for overhead transmission lines. In addition, there

are sections covering Association news, summaries of the E.R.A. reports published since the previous issue, and lists of the papers and articles read or published by members of the staff and extra-mural workers, and translations, bibliographies and reprints made available between November and February last. Copies can be obtained from the Association at Cleeve Road, Leatherhead, Surrey, price 2s 6d plus 6d postage.

Steel Tube Plant Extension

Tube Investments, Ltd., announces a £3 million project for doubling the capacity of the plant of its subsidiary, Tubes, Ltd., for the production of ball bearing and other heavy duty alloy steel tubes, at Desford, near Leicester. Preparatory work on the project is already in hand and the extensions are scheduled to be completed early in 1962.

Heat and Cable Insulation

A booklet has been published by the Cable Makers' Association in which is reprinted a statement on the effect of heat from modern electric lamps and fittings on cable insulations which appeared in the *Electrical Review* of 15th January last. The types of insulation dealt with include natural rubber, polythene, polyvinyl chloride, polychloroprene, butyl rubber, varnished cambric/heat resisting fibre, butyl rubber/asbestos roving and silicone rubber. Copies of the booklet can be obtained from the Association at 52-54, High Holborn, London, W.C.1.

Engineering Production and Orders

Production in the engineering and electrical goods industries in March is estimated by the Board of Trade at 19 per cent more than a year ago. Allowing for the incidence of the Easter holidays, which fell in March last year, the increase would be reduced to about 8 per cent. On the same basis, the increase in the first quarter was 12 per cent more than a year earlier and provisional estimates for April, based on the limited information so far available, suggest that production was 16 per cent more than in April, 1959.

The volume of orders on hand in March was 3 per cent more than in February, and 12 per cent more than in October when orders on hand began to increase; net new orders expanded rapidly in the first quarter.

Exports of products of the engineering and electrical goods industries in the first quarter were 13 per cent more by volume than a year ago, when

exports of these products were low. They were, however, 3 per cent higher than in the fourth quarter of 1959, and slightly above the record level reached in the second quarter of 1957.

I.E.A. 1962 Exhibition

The next Instruments, Electronics and Automation Exhibition will be held from 28th May to 2nd June, 1962. The exhibition is held biennially.

Price Reductions

Prestcold (Pressed Steel Co., Ltd.) announces that the price of its "New Big Four" D.432 refrigerator is now reduced from £70 12s 6d to £66 3s.

M.K. Electric, Ltd., has reduced the list prices of its range of cooker control units and has issued Leaflet 254 giving details of the range and the new prices.

Associated Electrical Industries, Ltd., Electronic Apparatus Division, announces that from 1st June the price of silicon controlled rectifiers has been reduced by 10 to 30 per cent, depending upon the rating.

Price Increase

Mantel Metalworkers, Ltd., announces that owing to the general rise in production costs it has increased its prices as from 1st June. Leaflets setting out the new prices are available.

Trade Announcements

Kenwood Manufacturing (Woking), Ltd., announces a changeover in its West Country system of merchandising. Business in Gloucester, Wiltshire and Somerset is now administered by Kenwood Electrics, Ltd., based at the new sales and service depot, Brigstocke Road, Bristol, 2 (telephone: Bristol 25172). This arrangement has been negotiated with Wessex Wholesale Electric, Ltd., which has represented Kenwood in this area in past years. Kenwood Electrics, Ltd., Berry Hill, Droitwich (telephone: Droitwich 2351-4), will administer business in the counties of Hereford and Monmouth.

Mr. H. B. Knight has been appointed a lamp and lighting representative attached to the Nottingham branch of the Midlands Region of **Philips Electrical, Ltd.** He will cover part of the city of Nottingham.

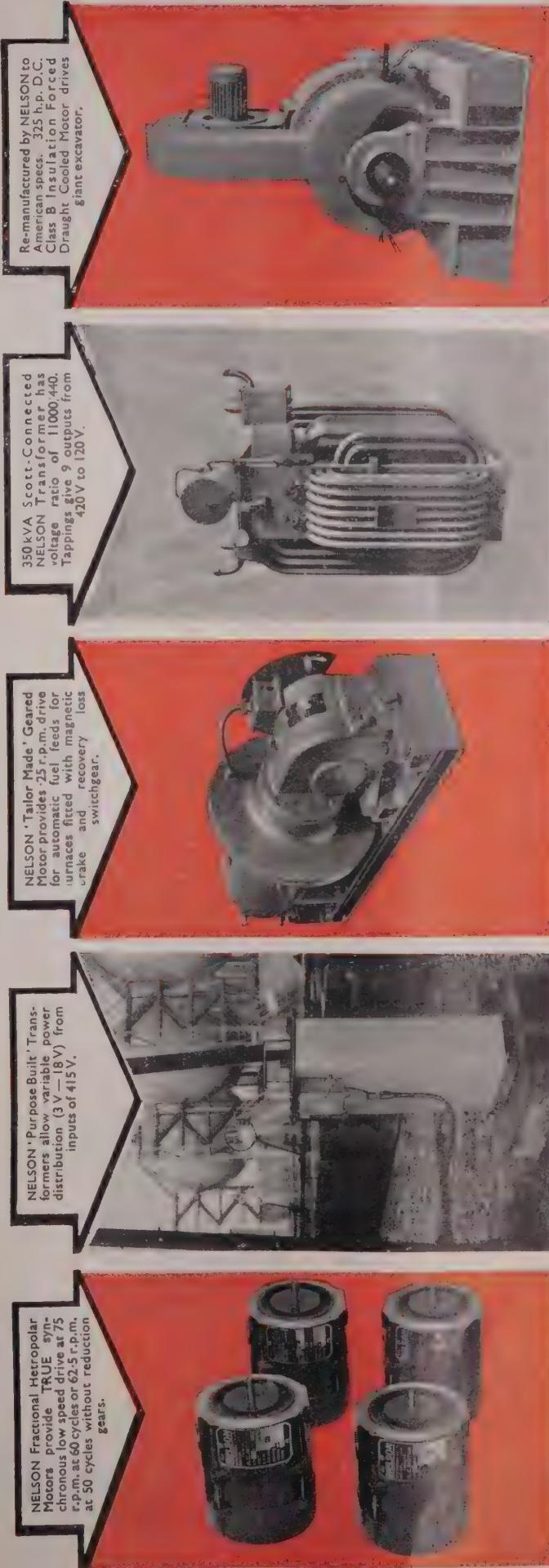
Shimwell, Alexander & Co., Ltd., manufacturers and suppliers of marine lighting equipment, now have a private automatic telephone exchange and the new number is Avenue 6111-7.

Annual Holidays

The East Pilton works, Edinburgh, of Bruce Peebles & Co., Ltd., will be closed for the Edinburgh trades holiday from 1st to 18th July.

Looking for 'something special' in

ELECTRICAL DRIVE or POWER CONVERSION



NELSON Fractional Heteropolar Motors provide TRUE synchronous low speed drive at 75 r.p.m. at 60 cycles or 62.5 r.p.m. at 50 cycles without reduction gears.

NELSON 'Purpose Built' Transformers allow variable power distribution (3 V to 18 V) from inputs of 415 V.

NELSON 'Tailor Made' Geared Motor provides 25 r.p.m. drive for automatic fuel feeds for furnaces fitted with magnetic brake and recovery loss switchgear.

350 kVA Scott-Connected NELSON Transformer has voltage ratio of 11000/440. Tappings give 75 outputs from 420 V to 120 V.

Re-manufactured by NELSON CO American specs. 325 h.p. D.C. Class B Insulation Forced Draught Cooled Motor drives giant excavator.

Specify NELSON for

NON-STANDARD A.C. & D.C. MOTORS & TRANSFORMERS

(up to 500 h.p.)

(up to 1,500 kVA at 33 kV)

We've said it all before . . . specialised personnel, specialised plant, years of practical experience in solving difficult applications . . . these enable us not only to find the answers but to manufacture them at economical cost and within a limited time factor. *Cogent reasons, aren't they?*, but for real evidence of what they mean pass us your next enquiry (AND THAT GOES FOR REWINDS UP TO 2,000 h.p., CONVERSIONS UP TO 5,000 kVA.)

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Noral goes to the Jaguar works with ten tons of aluminium busbar

More than ten tons of Noral aluminium busbar have been installed in the electro-plating plant of the Jaguar Works at Coventry.

Noral busbar, halves material costs, is light and easy to install in restricted spaces, and can be extruded in any desired cross-section, and is readily jointed by bolting or welding.

Noral can advise on any aspect of aluminium busbar, including current ratings and jointing techniques, and have long experience of meeting the needs of the electrical industry for aluminium rod, busbar, castings, transmission fittings and other materials.

For a copy of a publication on aluminium busbar, write to Noral Sales Development Division, Banbury, Oxon.

Noral

Noral

NORTHERN ALUMINIUM COMPANY LTD

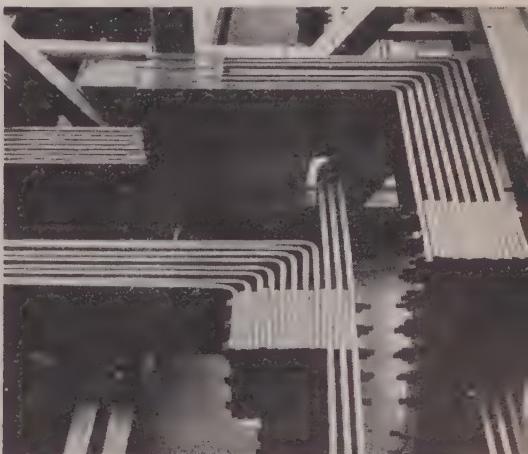
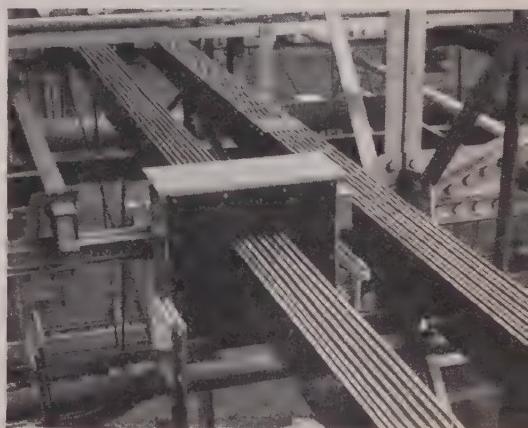
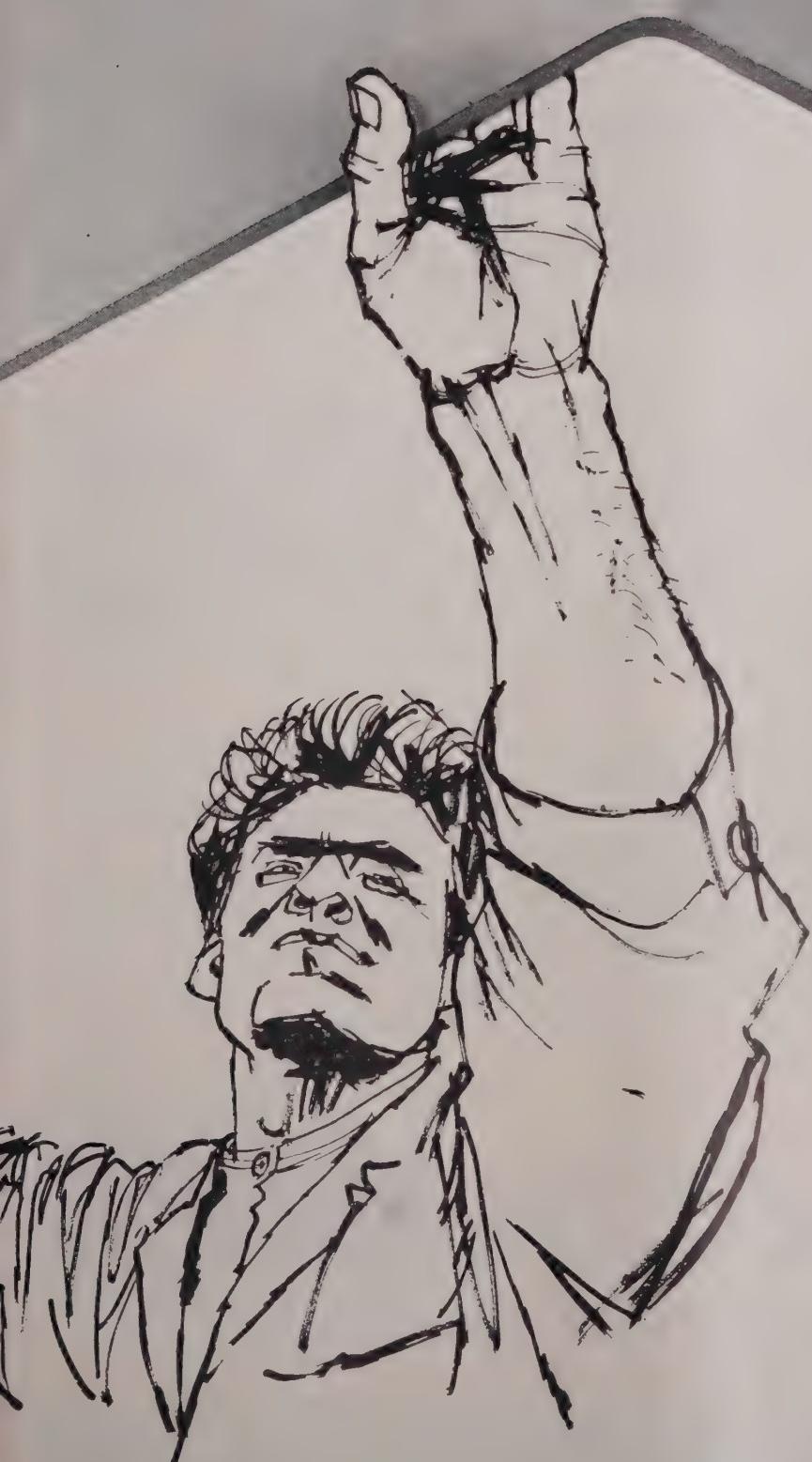
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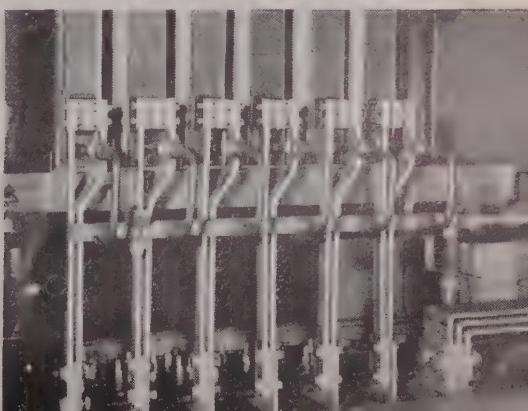
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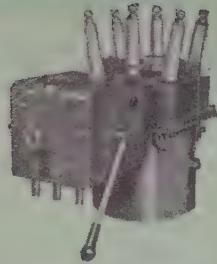




Above: In the main busbar installation in the new electro-plating plant at the Jaguar Works, about 10 tons of electrical purity aluminium, Noral CIS, is used. It has a minimum conductivity of 60% I.A.C.S. (Contractors: Electro-Chemical Engineering Co. Ltd.)

Below: Aluminium busbar is also used in these water-cooled rectifiers, part of the Jaguar installation (Manufacturers: Westinghouse Brake & Signal Co. Ltd.).

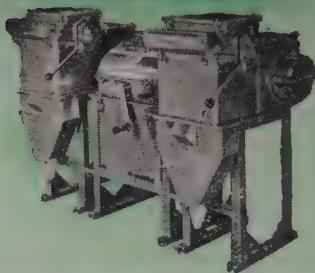




15 kV Oil Circuit Breaker for cubicle mounting



Heavy Current D.C. Circuit Breaker and Knife Switch Panel



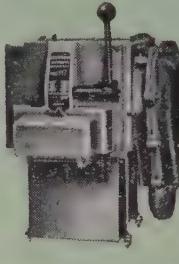
H.V. Ring Main Switchboard with Fuse Switch controlling Tee-Off



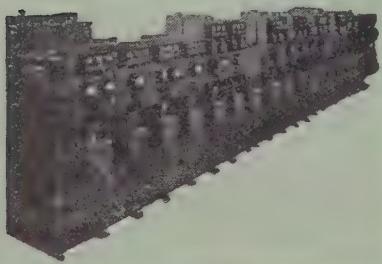
Small Air Circuit Breaker



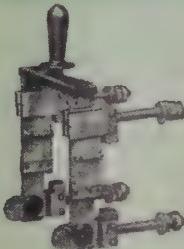
Ammeter and Voltmeter Switches



L.V. Industrial Oil Circuit Breaker



11 kV Metalclad Switchboard



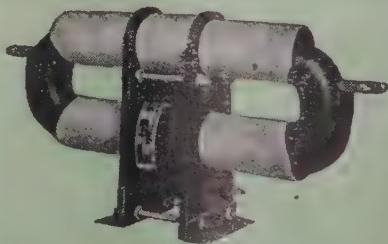
Panel Mounting Knife Switch



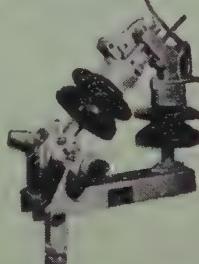
D.C. Switchboard for Steel Works



T.P. 11 kV Isolating Switch



Current Transformers



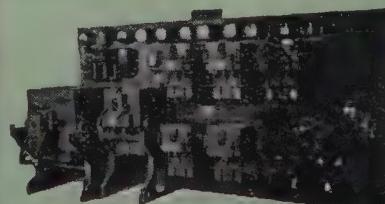
Outdoor Pole Mounting Isolators



H.V. Switchboard incorporating Automatic Fuse devices



**Specialists in Switchgear
for over 50 Years**



**Industrial Switchboard with Drawout
Oil Circuit Breakers**

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VIEWS on the NEWS

By "REFLECTOR"

I AM sure that everybody who attended the meetings of the British Electrical Power Convention at Bournemouth will agree that the way in which Lord Chandos conducted the proceedings made the whole affair even more delightful than usual. It can be said that while maintaining the dignity of the office the President succeeded in making it an unconventional Convention. Both at the "formal" sessions and at the Electrical Forum his brief interpositions provided a seasoning which made hard facts more palatable. Moreover most of the speakers this year seemed to have caught the spirit, with the result that the attention of the audiences was held and the somnolence which so often prevails was dispelled. Unfortunately most of the President's *mots* were strictly of the occasion and could only be properly appreciated in their setting.

* * *

Upon a number of occasions I have referred to the dissatisfaction, if not hostility, aroused among consumers by breakdowns in electricity supply or erratic voltage. The subject was raised in the discussion on Mr. H. G. Nelson's Convention paper when Mr. A. N. Irene expressed his conviction that consumers were more concerned about the reliability than the cost of electricity and were willing to pay for freedom from interruption of their supply. I am sure that he is right in his first point but I am not sure about the second. Whatever consumers pay they should be entitled to first-class service and they may not be pleased to be told that if they want such a service they must pay more. Of course, I am aware that supply "outages" are not all that widespread and I know that they occur principally because of the financial starvation of the Area Boards. Nevertheless much is made in the Press and elsewhere of temporary stoppages and the good name of electricity suffers.

* * *

One question put to the panel at the Bournemouth Electrical Forum was why the Electricity Boards did not sell radio and television sets. In answering the query Mr. Norman Elliott pointed out that the basis of the question was not quite sound—some of them did go in for this business. But he also said that the Boards' function was to sell electricity and so they should confine their appliance sales to items which required a reasonable amount of electricity in their operation. This was his own Board's policy and it applied also to "fashion" articles, such as lampshades. The Board

preferred to leave the business to contractors and retailers—a sentiment with which all those in the trade will agree. The problems raised by the servicing of radio and television sets were mentioned by Mr. S. F. Steward, but at the same time he thought that they played a useful role in the introduction of electricity into homes and were thus potential load builders. All the same the servicing of this equipment means the employment of specialist staff and people will want television sets anyway—and the necessary supply for them.

* * *

Amalgamations mean the disappearance of well-known names and products or the appearance of the products under a new guise. I learn that the May issue of *Distribution of Electricity*, the magazine published for many years by W. T. Henley's Telegraph Works Co., Ltd., is the last of the series. In its place we are to have a journal with a very similar name—*Electrical Distribution*—which will be the "mouthpiece" of the A.E.I. Cable Division and the Construction (Cables and Lines) Division. The final number of *Distribution of Electricity* includes a reproduction of the cover of the first number, June, 1928, and a brief historical note in which it is said:

"Under the 'Editorial' of our first issue was placed a sketch of an overflowing waste-paper basket—rather a daring gesture, as that self-same Editorial contained a request for contributions!"

* * *

Free Trade, the merits of the metric system, and competition from Germany—all still topics of interest in these days—were among the subjects discussed in a debate reported in extenso in the *Electrical Review* fifty years ago (10th June, 1910). One of the speakers, Mr. Oppenheimer, felt that Germany's adoption of the metric system had been an "enormous lever" in the progress she was making and proceeded:

"I ask you tonight how many of you gentlemen are able to tell me what systems of weights and measures are in existence in this country.... Assuming you are asked to construct an electric crane which would lift a certain load for an agricultural undertaking and the information at your disposal read somewhat as follows:—'We require an electric crane capable of lifting 36 trusses of hay.' Can any of you tell me how much weight is in a truss of hay?"

I must confess I do not know what the metric equivalent of a truss of hay is either.

Letter to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Floor Heating and Radiator Systems

IN their enthusiasm to advance the cause of heating by electricity, whether of the under-floor or radiator variety, your contributors on the above subject make very little mention of a salient point which is of the greatest importance to the ultimate user.

I do not think that any heating engineer will quarrel with the claim that under-floor electric heating is cheaper to install than the conventional low-pressure hot water radiator system, but I think it is going a little too far to make a comment that such systems as the latter cause rooms to be "cluttered up with radiators." It is well known that today hot water systems can be completely unobtrusive, firstly, by the modern use of small bore feed pipes which are pump circulated through the system and, secondly, by the design of a skirting board type of heater which presents no unsightly appearance but is, nevertheless, of an extremely high efficiency.

All other considerations apart, while first cost may to some be of prime importance, it is, in my opinion, of greater importance that the public at large should be advised, even if they are not already aware of the fact, that the running costs of a heating system using electricity are certainly higher than a system using solid fuel or oil. I think it is only right that emphasis should be given to this most important point and that it should not be glossed over in the enthusiasm to support any particular form of heating medium.

Ealing, London, W.13.

C. T. HARDINGHAM.

Electrical Exports Analysed

A STATISTICAL analysis of United Kingdom electrical and allied exports during the past three years* has been published by the British Electrical and Allied Manufacturers' Association. Exports to over eighty countries are listed for the years 1957, 1958 and 1959 for each of eighty product headings, and there is a summary for each heading of exports to the Commonwealth and Europe. Total exports of the main classes of equipment are also given in a separate table.

Electrical and allied engineering products form one of the largest groups in the country's export accounts. Last year's record total of £285 million amounted to 10 per cent of the total U.K. exports of manufactured goods. (The B.E.A.M.A. figures include certain items, such as steam turbines, which though not falling within the official customs classification "Electrical machinery, apparatus and appliances" are nevertheless part of the industry's export effort.) Progress in the last three years has been mainly due to turbines and communication and navigational aid equipment.

Four Commonwealth countries, South Africa, Australia, India and Canada, head the list of the industry's principal markets; in 1959 New Zealand was replaced in fifth place by the United States. The United States and Canada took

* "Territorial Analysis of British Exports of Electrical and Allied Machinery and Apparatus" (price 5s.)

some 12 per cent of U.K. electrical exports last year and about 20 per cent went to Europe. Exports to the Common Market increased by £1.5 million to £27.3 million while exports to the E.F.T.A. countries remained stable at £18.4 million. In 1959 about 39 per cent of exports of radio and electronic apparatus and 37 per cent of exports of domestic appliances were sent to Europe compared with 42 per cent and 51 per cent to the Commonwealth. The survey points out that recent increases in U.K. electrical exports have been at a somewhat slower rate than the average for world electrical exports.

A.M.E.E. REPORT

THE report for 1959-60 of the Executive Committee of the Association of Managerial Electrical Executive presented at the annual meeting at Bournemouth on 1st June shows an increase in membership and a sound financial position. Mention is made of the general increase in salaries secured last year but disappointment is expressed at the inadequacy of the increase. There is criticism of the delay in completing the Central Electricity Generating Board's reorganisation.

Other subjects covered in the report are the Staff Compensation Regulations; recruitment of electrical engineers and the new I.E.E. corporate membership examination regulations; and the position of district managers under the South Western Electricity Board's reorganisation.

British Association at Cardiff

THE 122nd annual meeting of the British Association for the Advancement of Science will be held in Cardiff from 31st August to 7th September, under the presidency of Sir George Thomson, F.R.S., Master of Corpus Christi College, Cambridge. The title of his presidential address will be "The Two Aspects of Science." Advance details of the meeting are given in the preliminary programme, which is now available free of charge from the Association at 18, Adam Street, Adelphi, London, W.C.2.

The programme contains the titles of the addresses by the Section presidents; that for the Engineering Section will be given by Sir Alfred Pugsley on "Statics and the Engineer." Papers of engineering interest will cover such subjects as novel methods of refrigeration, microwave technology, programming for computers and nuclear detection of non-radioactive materials. There will be two evening discourses and a programme of illustrated lectures for young people, including "Atomic Radiation and Materials," by Professor A. Charlesby of the Royal Military College, Shrivenham. There will also be a continuous showing of scientific films and a programme of social events.

World Power Conference

THE first session of the World Power Conference sectional meeting opened in Madrid on 6th June, attended by over 2,000 delegates from forty-eight countries. The first day's discussions dealt with conventional methods of producing energy. Papers were submitted dealing with methods of investigating sources of hydraulic energy ranging from hydro-electric power production in Spain, Japan and Norway to the possibilities of rain-making in Australia, and the efficiency of thermal power stations burning low grade fuels, including straw and chaff, which are used in boiler plants in Denmark.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. R. L. Oddie, F.C.A., has been appointed a director of the Brush Electrical Engineering Co., Ltd. He has been secretary since joining the company in January last year and he retains this position.

Mr. F. H. Wood, A.M.I.Mech.E., M.I.Loco.E., has been appointed executive director of the company. Since 1957 he has been manager of the Traction Division with responsibility for design, manufacture and sales of traction products. He commenced his career with W. G. Bagnall, Ltd., as

an apprentice and later became chief draughtsman. In 1952 he joined Brush-Bagnall Traction at Loughborough as chief mechanical designer and in 1955 he undertook additionally the duties of chief contracts engineer.

Mr. R. M. Atkinson retired from the position of managing director of Sulzer Bros. (London), Ltd., and of Hathorn, Davey & Co., Ltd., on 1st June and has been appointed chairman of the board of each company as from that date. **Messrs. E. H. Stagg, G. W. Heslett and M. W. Zublin** have been appointed joint managing directors of each company.

Mr. W. Acton, Assoc.M.C.T., M.I.Mech.E., M.I.E.E., has resigned his appointment as chief engineer of the Lyddon Division of the Parsons & Whittemore-Lyddon Organisation, and also his directorship of the Pulp & Paper Research Co., Ltd., and has joined the staff of Manderstam Technical Services, Ltd., which was formerly Manderstam, Lowe & Partners, Ltd., consulting engineers to the pulp and paper industry.

Mr. W. Glass, chairman of Johnson & Phillips, Ltd., recently presented the company's long-service award of a silver mounted leather wallet containing £50 in recognition of fifty years' service to **Mr. H. Kinge**, a contract engineer in the Switchgear Department. Mr. Kinge commenced work at J. & P. in 1910, in the Instrument Department and, during the latter years of the 1914-18 war, super-

vised the construction of the first radio receivers used in aircraft. Later, he designed the "Ethovox" loudspeaker produced by J. & P. for Burndept, Ltd. His present work is concerned with substation installations and he was deputed to act in a liaison capacity to the Russian Trade Delegation in connection with a switchgear-transformer contract undertaken by J. & P. in recent years.

Mr. John Spence, B.Sc., A.M.I.E.E., has joined Metal Industries, Ltd., as personal assistant to Sir Charles Westlake, the chairman. Mr. Spence was formerly planning engineer with the Uganda Electricity Board. During the war he served in the R.A.F. as a flying officer.

At the annual general meeting of Wm. Sanders & Co. (Wednesbury), Ltd., held on 31st May, **Mr. J. B. Priscott** was appointed director and secretary, **Mr. W. C. B. Heywood**, sales director, and **Mr. Bayley Manion**, design director.

Mr. T. West, who for the past 2½ years has been press and publicity manager of E.M.I. Electronics, Ltd., left on 1st June to take up a new appointment with the Fairbanks Whitney Corporation of New York which, under a new arrangement, will be marketing the company's products throughout the United States.

Members of the Birmingham Electric Club numbering 100 held their annual outing recently when they visited the South Wales Switchgear, Ltd., works at Blackwood and saw the production of the company's high

voltage switchgear. After lunch they visited the company's low voltage switchgear works at Aberbargoed and the Treforest Trading Estate.

The annual general meeting of the Sussex Centre of the Electrical Industries Benevolent Association will be held on Monday, 20th June (6 p.m.), at the offices of the South Eastern Electricity Board, 10, Queen's Gardens, Hove, 3, Sussex.

Mr. R. V. Ely, M.I.Mech.E., M.I.E.E., has resigned from the boards of Lancashire Dynamo Holdings, Ltd., Foster Transformers, Ltd., and Foster Electrical Supplies, Ltd.

Mr. G. H. Doust has been appointed general manager of Plessey International, Ltd.

Before joining the company in 1958, as deputy to the general manager, he was with the Plessey Chemical and Metallurgical Division at Towcester, Northants, where he controlled the commercial and

sales department, and before that he was field sales manager of the Metal Finishing Division of the Pyrene Co., Ltd.

Mr. S. H. Bailey, who has been publicity manager for George Ellison, Ltd., since 1934, has retired and he has been succeeded by **Mr. D. I. Herbert**. Mr. Bailey has been with



Members of the Birmingham Electric Club at the works of South Wales Switchgear, Ltd. In the front row are (left to right), Mr. J. R. Anderson (commercial officer, Midlands Electricity Board), Mr. A. J. Nicholas (managing director, South Wales Switchgear), Mr. R. Paterson (president of the Club), and Mr. W. S. Lewis (chairman, M.E.B.).

the Ellison companies for forty-six years.

United Ebonite & Lorival, Ltd., Bolton, held an open day on 14th May when 2,870 visitors were received. The factory, including laboratories and drawing offices, was open and 400 workers volunteered for the special Saturday afternoon shift so that visitors could witness the wide range of work carried out.

Mr. J. M. Surrall, who has been a director of the Simplex Electric Co.,



Mr. J. M. Surrall

Ltd., for the past thirteen years, has retired. He joined the company, which was then known as the Simplex Steel Conduit Co., as an office boy in 1903. In 1912 he was made manager of the Heating and Cooking Department,

and in 1920 he became sales manager of the company, then reorganised under the name of Simplex Conduits, Ltd. In 1932 the company became the Simplex Electric Co., Ltd., and Mr. Surrall was made joint sales manager. He was appointed general commercial manager in 1946 and a director in 1947.

Mr. B. A. Williams, chairman of Westool, Ltd., has been appointed by the Lieutenant Governor of the Isle of Man to survey the industrial conditions and potential of the island, and to suggest ways of broadening its economy. He will also endeavour to discover and remove any causes of dissatisfaction that have arisen recently with regard to the establishment of new industries on the island.

Mr. A. Clark previously general manager of the British Driver-Harris



Mr. A. Clark

Co., Ltd., has been appointed a director. He joined the company in 1929 and worked in the laboratory for fifteen years. In 1944 he became assistant works manager of the Cable Department, and in 1951 he transferred to high nickel alloy production, three years later becoming general manager.

The chairman and directors of Goblin, Ltd., recently gave an "at

home" to the Leatherhead staff and staff from other factories in the country and their families. Also present were members of various business concerns with whom the company has contact during the year. Over a thousand people attended and there was an exhibition of the company's products, one part of which was devoted to a history of the vacuum cleaner, including a scale model of the first cleaner designed by Mr. H. C. Booth, a former director of the company.

Nearly 200 employees of Dimplex, Ltd., with their families and friends, attended the annual works outing held on 28th May, when they visited Warner's Holiday Camp on Hayling Island.

Mr. B. Hollingworth, A.M.I.E.E., has been appointed assistant sales manager (mining)

of British Insulated Callender's Cables, Ltd., in succession to **Mr. J. A. Rodgers**, who is now divisional sales manager (accessories).

Mr. Hollingworth served a five-year electrical engineering apprenticeship with the Parkhouse Colliery Co., Ltd., followed by three years' service in the Royal Engineers and R.A.E.C. He joined the Wiring Development Department of B.I.C.C. in 1950 and was appointed mining sales engineer in 1953 responsible for the territory covered by the North East Division of the National Coal Board. He is an associate member of the Association of Mining Electrical and Mechanical Engineers.



Mr. B. Hollingworth

OBITUARY

Mr. C. N. Rogers.—The death has occurred, at the age of fifty-four, of Mr. Charles Norman Rogers, founder of the electrical engineering business of C. N. Rogers, Leicester. He was a past-president of the Leicester branch of the Electrical Contractors' Association and a founder-member of the Leicester Electrical Association.

Mr. W. Owen, M.I.Mech.E., chief designer of the Gear Hobbing Machine Division of Craven Brothers (Manchester), Ltd., until his retirement in 1955, died on 2nd June. Mr. Owen had been a committee member of the Admiralty Vickers Gearing Research Association and of the Gearing Section of the British Standards Institution.

Formerly technical director and joint managing director of William Muir & Co., Ltd., later known as Muir Machine Tools, Ltd., he designed the first turbine gear hobbing machine in collaboration with the late Sir Charles Parsons on the introduction of turbines for ship propulsion.

Mr. C. G. Whitehead, managing director of Whitetrade, Ltd., Rochester, died on 24th May.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical

ALUMINIUM ingots	ton £180 0s od
COPPER, H.C. Electro	ton £246 15s od
Fire Refined 99·70%	ton £245 0s od
Fire Refined 99·50%	ton £244 0s od
COPPER Tubes	lb 2s 4d
Sheet	ton £278 5s od
H.C. wire and strip	ton £288 15s od
LEAD, English	ton £76 5s od
Foreign	ton £75 0s od
MERCURY	flask £70 10s od
TIN, block (English)	ton £786 10s od
ZINC, G.O.B. Foreign	ton £91 10s od
BRASS Tubes (solid drawn)	lb 1s 11½d
Wire	lb 2s 9d
PHOSPHOR BRONZE	lb 4s 2½d
Wire	oz £28 10s od
PLATINUM	spot
RUBBER, No. 1 R.S.S.	lb 38½d—39d

industry. The figures given are the selling prices and are those quoted on Tuesday last.

Society of Relay Engineers

Mr. R. I. Kinross, M.I.E.E., managing director of Rediffusion Research, Ltd., was elected president of the Society of Relay Engineers at the annual general meeting held on 24th May. Mr. R. P. Gabriel, M.I.E.E., A.M.Brit.I.R.E., was elected vice-president and Mr. A. S. Whitenstall, A.M.I.E.E., A.M.Brit.I.R.E., hon. treasurer.

The meeting approved the Committee's intention to establish closer liaison with European and American relay engineers and to arrange an interchange of technical literature.

Following the annual general meeting Mr. P. Bass, Graduate I.E.E. (Rediffusion Research, Ltd.), gave a paper entitled "The Influence of Cable Characteristics on the Design and Performance of Television Relay Systems." The next lecture meeting of the Society will be held in London on 18th October next when Mr. B. W. Osborne (Rediffusion Research, Ltd.) will give a paper entitled "Picture Quality Control Equipment for Wired Television Networks."

New Books

Principles of Electricity and Magnetism. By Y. Rocard. Pp. 779; figs. Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 70s.

This is an exceptionally comprehensive volume based on lectures delivered at the Sorbonne in 1941-42 and ably translated by G. F. H. Harker, M.A. The book is divided into nine sections dealing with Electrostatics, Magnetism, Electrokinetics, Electrodynamics, Alternating Currents, Propagation and Radiation, The Free Electron, Electrolysis and Units.

It would appear that the lectures were primarily intended for pure science students, since much greater attention is given to fundamental principles than to technology. The treatment of the applications of electricity and magnetism is, in fact, very superficial and hardly worth the space devoted to them. On the other hand, the theoretical aspects of the subject receive treatments requiring a good knowledge of the calculus. The pages are packed with information but explanations are often poor, and it is doubtful if many students will be able to follow many of the proofs and descriptions without the assistance of lectures or other textbooks.

For electrical engineering students, this volume has the serious disadvantage that the text uses the electromagnetic and electrostatic c.g.s. systems of units, though the author mentions on p. 713 that "within the near future, the traditional exposition of electricity will be remodelled" by the adoption of the rationalised m.k.s. system. Had the latter been used, the author would not have mixed up B and H so indiscriminately. The term "magnetic field" is used to refer to both B and H, and the force on a current-carrying conductor is given in some places as *Hli* and in other places as *Bli*. Figs. 4, 7 and 19 of Chapter 22 on d.c. machines are incomprehensible—in fact, the whole chapter is poor. The statement in p. 332 that large industrial transformers have efficiencies between 90 and 95 per cent does not reflect current practice.

The text is exceptionally free of typographical errors and the diagrams are clearly reproduced, but there are no worked examples or problems. It is probable that pure science students may find this volume useful; but in view of the high price, the use of c.g.s. units and the superficial treatment of electrical apparatus and machines, it is doubtful if this book will appeal to electrical engineering students.—E.H.

Applied Electricity. 5th edition. By H. Cotton. Pp. 516; figs. Cleaver-Hume Press, Ltd., 31, Wright's Lane, London, W.8. Price 25s.

In this, the fifth edition of this well-known book, a number of new features have been included. One of the most important of these is the chapter on electronics, which includes a section on non-linear resistors and semiconductors, with suitable diagrams. A number of worked examples reflecting current examination questions have been added to many of the chapters. Based on the syllabus of Part I of the London B.Sc.(Eng.) degree, the book is also suitable for the joint Section A of the professional syllabuses, for the City and Guilds Intermediate

Grade and for Ordinary National Certificate work. The M.K.S. system is employed but the subject of units is treated such that the c.g.s. system can be used if desired.

Polythene: The Technology and Uses of Ethylene Polymers. 2nd edition. Edited by A. Renfrew and P. Morgan. Pp. 874; figs. Published for *British Plastics* by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 165s.

This book sets out the basic facts of all aspects of polythene production, properties, handling techniques and major uses. The present edition contains some 300 additional pages. Valuable appendices are a table of world manufacturers of polythene and their production capacities, and a list of world proprietary names for ethylene polymers.

Problems in Electrical Engineering. 7th edition. By S. Parker Smith, edited by N. N. Parker Smith. Pp. 370; figs. Constable & Co., Ltd., 10, Orange Street, London, W.C.2. Price 20s.

The first edition of this book was published in 1929 and contained 792 problems; since then the total has risen to 1,981. The principal changes in the new book occur largely in the field of electronic and light current engineering. The chapter on transients now covers the use of pulse techniques in testing lines and amplifiers, and there is a new chapter on junction type transistors which includes several problems on the general theory of four terminal networks. The majority of the problems are stated in both M.K.S. and c.g.s. units.

Television Explained. 7th edition. By W. E. Miller. Revised by E. A. W. Spreadbury. Pp. 202; figs. 89. Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 12s 6d.

This is the seventh edition of a book designed for those requiring technical information on domestic television presented in a simple, straightforward manner. In this edition a chapter has been included on combined television and f.m. receivers and the opportunity has been taken to revise the rest of the book where necessary. This book assumes a knowledge of the ordinary sound radio receiver but no previous knowledge of television circuits. It is non-mathematical and comprehensively illustrated by many diagrams and photographs.

BOOKS RECEIVED

Transformers and Generators for Power Systems. By R. Langlois-Berthelot. Pp. 541; figs. Macdonald & Co. (Publishers), Ltd., 16, Maddox Street, London, W.I. Price 65s.

Electromagnetic Fields, Energy, and Forces. By R. Rano *et al.* Pp. 520; figs. John Wiley & Sons, Inc., New York. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 96s.

Factory Law. Supplement to sixth edition (to 1st November, 1959). By H. Samuels. Pp. 71. Stevens & Sons, Ltd., 11, New Fetter Lane, London, E.C.4. Price 12s 6d.

Financial Section

STOCKS and SHARES

MOST of the companies which end their financial years with the calendar have now published their results for 1959 and a general review of them suggests that in a great majority of cases shareholders have again had reason to be pleased with the figures reported and the dividends declared. Comparisons with 1958 results are, of course, between a year in which the effects of the great credit squeeze were only beginning to wear off and a period during which expansion was being actively encouraged. Improvements were, therefore, in the natural order of things. It was to be expected also that they should have been larger in the field of consumer goods than in the capital industries, which reacted more ponderously to the easement of restrictions.

Earnings and Dividends

The following table compares the financial results reported in recent months by a variety of electrical companies with those of the previous year:

Company	Earned %		Paid %
	1958	1959	
Aberdare	39	42	17½
A.E.I.	20	17	15
B.I.C.C.	34	29	13½
Bruce Peebles	29	8	10
Bulgin, A. F.	102	122	55
Bulpits	42	42	16½
Chloride Elec.	23	37	17½
Desoutter	68	87	30
Enfield R.M.	30	26	15
English Elec.	19	17	10
Ericsson Tel.	20	20	13
Goblin	13	30	12½
Hoover	162	350	90
Hunt, A. H.	49	78	20
Laurence & Scott	48	51	15
M.E.M.	27	28	12
Newman Ind.	20	42	12½
Parsons	34	38	9·4
Radiation	12	38	12
Reyrolle	50	50	17½
Switchgear & Cowans	29	43	17½
Tel. Condenser	54	87	35
Watford	66	50	25
West, Allen	31	26	12½
Wolf Elec.	23	35	12½

Earnings in this table are calculated from the net profits available for ordinary dividends, after deduction of tax and prior charges, and are expressed as a gross percentage on the issued capital. Adjustments have been made where applicable for increases in capital through scrip distributions, but not for cash issues.

Dividend Cover

In the foregoing table the rates of dividend paid this year may be compared with the latest earnings figures

to give the so-called "cover" for the current distributions. This remains, of course, an important factor in the market assessment of a share's value. It may be noted that although 16 of the 25 companies listed distributed more this year than in 1959, dividend policies of most of them remained sufficiently on the conservative side to leave between two and threefold cover for the amounts paid out. Put in another way, these companies ploughed back about 70 per cent of the surplus profits into their businesses.

Yields Now

Over the industrial market as a whole this year's combination of reduced share prices and better dividends has raised the average yield from leading issues to about 4½ per cent. In the electrical markets, yields on the basis of the latest dividends cover an extensive range. At the lowest end of the scale are the firmly accredited "growth" shares such as those of Elliott-Automation, yielding barely 2 per cent, also Thorn Electrical, I.C.T., Plessey, Ward & Goldstone and E.M.I., all offering 3 per cent or less. On such shares as Crompton Parkinson, Hoover, E. K. Cole, Decca "A" and Reyrolle the yields are between 4 to 4½ per cent, and returns of around 4½ per cent are shown for instance on English Electric, Chloride Electrical, Automatic Telephone, Electric Construction and Allen West. On A.E.I., G.E.C. and B.I.C.C. current returns are a little above the 5 per cent mark. The 6 to 7 per cent yield bracket includes Aerialite, Hackbridge Holdings, Southern Areas and Falk Stadelmann.

Metal Industries Issue

Metal Industries are raising the best part of £4 million by an issue of nearly 1½ million new £1 shares. Dealings in these have been taking place at a premium of around 10s on the price of 5s at which they are offered to shareholders. The cash proportion of the consideration which the company paid earlier this year for the acquisition of Lancashire Dynamo amounted to £5½ million. Of this, £2 million was found from existing resources and the balance remained as an overdraft. The funding of the latter is the main object of the new issue. In their statement to shareholders, the company estimate that net profits for the year ended last March amounted to about £2½ million, before tax, this figure including total profits of the Lancashire Dynamo group for the twelve months up to December and those of the M.I. group up to March. They expect approximately the same figures for the current

year, in which event the intention is to pay dividends totalling 15 per cent on capital as now increased. On this basis the new shares at an all-in price of 64s offer a yield of nearly 4½ per cent and they will be transferable free of stamp duty for some weeks.

Telegraph Condenser

The 10s shares of the Telegraph Condenser company are now quoted "ex" a 50 per cent scrip issue, and in the new form have changed hands recently at around 46s. Last year's boom in radio and domestic equipment helped the company to achieve a record turnover, the outcome of which was a 45 per cent rise in the group trading profit and the addition of a 10 per cent cash bonus to the 25 per cent rate of dividend paid for each of the previous six years. The total payment of 35 per cent is covered 2½ times by available earnings, and the yield on the 10s shares works out at just over 5 per cent, assuming that the rate is scaled down in proportion to the increase in capital. At last month's annual meeting the chairman said that tighter money policies might have the effect of checking expansion, but meanwhile the order book and the state of business were satisfactory.

A. Reyrolle

One of the principal Stock Exchange dealers in electrical shares has published recently an analysis of the position of A. Reyrolle in the light of the agreements under which the company sold half its interest in C. A. Parsons to A.E.I. in exchange for 1,525,000 of the latter company's shares. They calculate that at recent market prices, Reyrolle's principal shareholdings in A.E.I., Parsons and Pyrotexan were together worth over £9½ million, which is equal to nearly 21s 6d per Reyrolle share, so that with the latter quoted around 40s the trading business is valued at the equivalent of only 18s 6d, or less than half the balance sheet value. From the revenue point of view they work out that this year's share exchange has the effect of adding about £60,000 to the income from investments, and that if there is no change in receipts from the other shareholdings the income from this source is sufficient to cover almost 60 per cent of Reyrolle's present rate of dividend. The survey also considers that the link with A.E.I. is advantageous from the point of view of broadening the basis of the interests and of saving expenditure on development and research.

[Our share list, which is not published owing to the Whitsun holiday, will appear again as usual next week.]

REPORTS and DIVIDENDS

Simms Motor & Electronics Corporation, Ltd.—The main figures in the accounts for 1959 were given in our issue of 27th May.

In his review of the year, which has been circulated, Mr. G. E. Liardet (chairman and managing director) says that the increase of profit for the year arises from improved performance by most of the companies in the group, which is the result of rationalisation of activities and the integration of the M.E.C. companies with the previous Simms companies. They devoted a great amount of effort to technical progress and the electronic research laboratory, previously at London Colney, has now been installed in a new and larger building at the Park Royal site. Expansion has also taken place at the hydraulic research laboratory at West Molesey. The Production Development Division has also been transferred to more spacious accommodation at Park Royal.

They do not regard 1959 as a peak year. Their policy is to build up still further the research and development activities and to expand to meet the growing demands of the motor industry and the other industries which they serve. All this will call for substantial capital investment and particulars of the means of raising further funds will be announced in due course. The order books and output from the factories are running at record levels and Mr. Liardet hopes they will be able to present to shareholders at least an equally satisfactory report next year.

Stone-Platt Industries, Ltd.—The annual meeting will be held on 23rd June. In his statement, which has been circulated to stockholders, Sir Kenneth H. Preston (chairman) says that in spite of increased turnover in the last quarter of 1959, the total output for the year was some 11 per cent lower than in 1958. Future prospects are, however, much more encouraging. The order book of the group at 31st December last was 20 per cent greater than at the end of the previous year. Turnover for the first quarter of the current year was 15 per cent up on the corresponding quarter of 1959 and orders received in the first three months were 20 per cent higher than the three-monthly average for the previous twelve months.

Dealing with the activities of the subsidiary companies, Sir Kenneth says that orders for train lighting and air conditioning equipments received by J. Stone & Co. (Deptford), Ltd.,

have again been received during the year from railways all over the world. The volume of new train lighting business, however, is decreasing, partly because post-war railway rehabilitation programmes have largely been completed and partly because a significant proportion of the Commonwealth railways' requirements is now being met from indigenous manufacture by the group's overseas subsidiaries. An increasing interest is being shown by a number of railways in the use of alternating current as opposed to the traditional direct current for train lighting purposes and, therefore, a completely new range of alternators and associated control gear has been developed, including semiconductor power rectifiers for which it is expected that there will be an increasing market outside the railway field.

Davis & Timmins, Ltd.—The annual meeting was held on 3rd June, when Mr. F. Le Neve Foster (chairman), who presided, in the course of his address said that the results for the past year again showed a considerable improvement on those for the previous year, and were mainly attributable to the increased production and sales turnover which had been achieved. Group sales, both in volume and weight, were a record and showed an increase over those of the previous year of the order of 25 per cent. In the current year production was being maintained at a high level. During 1959 considerable progress was achieved in marketing well-known products, for which they had the sole selling rights, and during the current year sales of those items had already reached new record levels.

Johnson & Phillips, Ltd., incurred a loss of £144,084 in 1959; in the preceding year there was a profit of £21,397. The interim dividend was passed and the board has decided not to pay a final dividend; a single payment of 5 per cent was made last year. It is proposed, however, to make a tax-free payment of 3 per cent from capital profits in July.

Sturtevant Engineering Co., Ltd.—The annual meeting was held on 20th May, Mr. H. W. Wagner (chairman) presiding. In his review of the year, which had been previously circulated, the chairman said that the overall position resulting from the decline in orders during the latter part of 1958 did not rectify itself in 1959 until it was too late to convert any appreciable portion of those orders into sales. The

great bulk of deliveries for the whole of the year came from the Electrostatic Precipitation Department, but this effort was not sufficient to offset the reduction in output from the remainder of the company. Orders received by all departments, other than the Electrostatic, were a record and this should have an effect on sales in 1960. The orders in the Electrostatic Department were disappointing.

Considerable sums had had to be expended on development work and to overcome technical difficulties arising on contracts where conditions had proved to be very different from those known at the time of the placing of the orders. In the majority of cases they had been successful in finding satisfactory solutions. As a result of this development, the first installation, consisting of twenty plants of the most modern design, had been working in a highly efficient manner on the largest boiler operating in a generating station in the United Kingdom. They would be receiving, during the course of this year, at least one large order for further plant, in this case to operate in conjunction with a boiler double the size of the one now steaming, as well as other important contracts. The Australian company is now operating on a profitable basis.

Chloride Electrical Storage Co., Ltd.—The annual meeting was held on 31st May, Mr. A. W. Browne (chairman and managing director) presiding.

In his review of the year, which had been previously circulated, the chairman said that the income from trading, which was an all-time record, was derived from three main sources, namely, battery activities in the United Kingdom, battery activities overseas, and activities in other industries. Of the total trading, the United Kingdom battery proportion accounted for approximately three-fifths, and the other two were roughly one-fifth each. All three divisions had made a satisfactory contribution. Whilst nearly all sections had shown improvements, the outstanding increases had been in automotive batteries for the motor vehicle manufacturers and in traction batteries for electric road vehicles and industrial trucks. The expected increased efficiency following rationalisation of manufacture was now being reflected in the improved profitability of those parts of the battery organisation concerned with the changes. This reorganisation had also provided a sound basis for the large-scale expansion on which they were now engaged.

principally to meet the anticipated future demands for automotive and traction batteries. The overseas companies had produced better results, the only exception being in Australia where the substantial reorganisation had not yet had effect.

During the year they started a new form of overseas manufacturing development in association with the Lucas company, the purpose of which was to enable manufacturing facilities for automotive batteries to be established in those countries to which, usually for tariff reasons, they could no longer export, and where the potential demand did not justify two separate enterprises. The first projects were to be undertaken in Ceylon and Malaya.

Although the capital commitments as shown in the accounts amounted to no more than £275,000, the plans at present in hand for the considerable expansions to their factories would require all the resources at their disposal and the expected increased trading would inevitably require additional finance for stocks and debtors.

The order books are well filled and sales for the first quarter of the current year were greater than those for the corresponding period last year.

The Anglo-Portuguese Telephone Co., Ltd., held its annual meeting on 8th June. In his circulated review of the past year, Mr. A. F. Roger (chairman) says that due largely to a greater use of the telephone in Portugal, the revenue position has proved more buoyant than expected. As a result of the good 1959 position and for the reason that the improved trend is being maintained, there is now no necessity for the company's application to the Portuguese Government for an adjustment of the telephone rates to be pressed and it has accordingly been deferred. The general pattern of progress and expansion continued in 1959, and by the end of the year the total number of stations in service had reached 253,552, an increase of over 23,000 in the year. There is every reason to believe that the anticipated further improvement in productivity, and consequently in living standards, will create an additional demand for telephone service.

Cape Asbestos Co., Ltd.—The net group profit for 1959 attributable to the parent company, after meeting all charges, including £637,368 for taxation, is £901,031, and it is proposed to pay a final dividend of 15 per cent, making 20 per cent for the year on increased capital.

In his statement to shareholders, Mr. G. F. Newton (chairman) calls

attention to the current "irrational competition" for insulation contracts.

In both the nuclear and conventional power station fields this continues to be so fierce that the trade is in the absurd position of carrying out millions of pounds worth of business for a return which must in many cases be negligible. In general, however, owing to the integrated nature of its business, the company has been able to avoid the worst consequences of this irrational competition. Sales of subsidiary companies' products have in nearly all cases registered a marked increase, and the volume of marine business has again shown a satisfactory and growing tendency. A pleasing feature of the results has been the success which has attended the group's policy of diversification. Profitability of the group's asbestos mining operations in South Africa has shown an improvement on 1958.

The British Thermostat Co., Ltd., reports that after providing £415,753 for taxation, the group net profit for the year to 31st January last is £396,581, as compared with £441,160 for 1958-59. To this is added provisions not required of £44,342. General reserve, including statutory reserve in a foreign subsidiary, receives £207,937, and it is proposed to pay a final dividend of 15 per cent, making 20 per cent for the year on capital doubled by a scrip issue. For the previous year the total distribution on the smaller capital was 35 per cent, which included a bonus of 5 per cent.

Reliance-Clifton Cables & Industrial Products, Ltd., is again paying a final dividend of 9 per cent, maintaining the total distribution for 1959 at 15 per cent, but the tax-free capital profits distribution is to be raised from 3½ to 5 per cent. The group net profits fell from £244,490 to £205,641. The directors attribute this to the adverse conditions prevailing since May last year but they say that there was a further increase in investment income.

Lightfoot Refrigeration, Ltd.—The consolidated trading profit for 1959 amounted to £146,729, as compared with £187,728 for 1958, and the net surplus, after deducting taxation of £39,908, is £54,649 (against £76,341). It is proposed to pay a final dividend of 7 per cent, making 10 per cent (same) for the year on reorganised capital.

Falk, Stadelmann & Co., Ltd., have declared an interim dividend of 5 per cent (unchanged).

Turner & Newall, Ltd., are paying an interim dividend of 5 per cent (unchanged).

New Companies

Hartley Services, Ltd.—Registered 5th April. Capital £1,000. To acquire the business of a manufacturer of fluorescent fittings and electrical goods carried on by L. Raymond, at 7, Great Clowes Street, Salford, 7. Directors: L. Raymond, Mrs. Rebecca Raymond and W. Westby. Regd. office: 7, Great Clowes Street, Salford, 7.

F. T. Holdcroft, Ltd.—Registered 28th March. Capital £5,000. To acquire the business of electrical engineers and contractors carried on by F. T. Holdcroft at Hanley, Stoke-on-Trent, etc. Solicitor: W. T. Beswick, 43, Broad Street, Hanley, Stoke-on-Trent.

Osmor (Windings), Ltd.—Registered 28th March. Capital £100. Manufacturers of and dealers in radio and electrical transformers, chokes, coils, etc. Directors: Dora Morgan and A. V. Lake. Regd. office: 418, Brighton Road, Croydon, Surrey.

Robert Myers & Co., Ltd.—Registered 28th March. Capital £1,000. Electrical, mechanical, radio, gas, sanitary and general engineers, manufacturers of and dealers in fluorescent and cathode tubes, etc. Directors: R. Myers and L. Black. Regd. office: Lloyds Bank Chambers, Lansdowne, Bournemouth.

Liquidations

Central Electrical Co. (Colchester), Ltd.—Particulars of claims by 14th June to the liquidator, Mr. F. J. Eves, of Bensusan-Butt, Eves & Co., 8, West Stockwell Street, Colchester.

R.V.R. Components, Ltd., electrical wholesalers, 48, Market Place, Reading.—Winding up voluntarily. Joint liquidators, Mr. G. Talfourd-Cook, 64-65, St. Mary's Butts, Reading, and Mr. R. A. Hawken, 1, John Street, Bedford Row, London, W.C.1, appointed 6th May. Particulars of claims to the liquidators by 24th June.

Cowley Electrical, Ltd., electrical retailers, 48, Market Place, Reading.—Winding up voluntarily. Joint liquidators, Mr. G. Talfourd-Cook, 64-65, St. Mary's Butts, Reading, and Mr. R. A. Hawken, 1, John Street, Bedford Row, London, W.C.1, appointed 6th May. Particulars of claims to the liquidators by 24th June.

Lamberts Electrical, Ltd., electrical retailers, 48, Market Place, Reading.—Winding up voluntarily. Liquidator, Mr. G. Talfourd-Cook, 64-65, St. Mary's Butts, Reading, appointed 6th May. Particulars of claims to the liquidator by 24th June.

Bankruptcies

D. Cornish, trading as Cornish and Graham, at 6 and 8, Maperton Road, Bradford, as an electrical engineer and contractor and hardware retailer.—Receiving order made 16th May on debtor's own petition. Public examination 19th July at the County Court, Manor Row, Bradford, I.

R. Bond, carrying on business at 361, Easton Road, West Derby, Liverpool, under the style of B.B. Machines (Liverpool), electrical dealer.—Receiving order made 16th May on debtor's own petition. Public examination 26th July at the Court House, 5th Floor, India Buildings, Water Street, Liverpool, 2.

F. T. Hunt, lately carrying on business in partnership with another at 24, Fore Street, London, N.18, under the style of Sonby Electric Co., wholesaler of electrical goods.—Receiving order made 24th May on a creditor's petition.

E. J. Little, lately carrying on business in partnership with another at 24, Fore Street, Edmonton, London, N.18, under the style of Sonby Electric Co., wholesaler of electrical goods.—Receiving order made 24th May on a creditor's petition.

J. L. Wood, formerly carrying on business under the style of Star Electrical at 62, George Street, Manchester, electrical engineer and contractor.—Trustee, Mr. W. H. Meredith, 20, Byrom Street, Manchester, 3, Official Receiver, released 27th May.

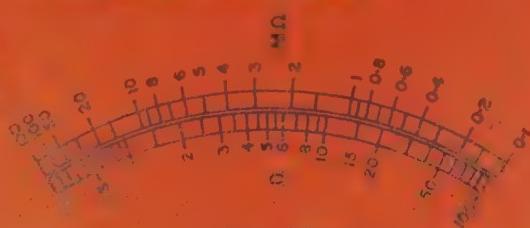


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NEW ELECTRICAL EQUIPMENT

Bearing Mounted Clutches

Electromagnetic bearing mounted clutch and clutch/couplings are now available from WESTOOL, LTD., St. Helen's Auckland, Co. Durham. In these the field unit, which carries the coil, is mounted on the rotor with its own bearing and a torque arm restrains the field from moving with the rotor. This ensures that the field unit is automatically held concentric with the rotor which eliminates prior assembly by the user, and, if the rotor and shaft tend to move due to shaft bearing wear, the field automatically follows and at no time is it possible for the rotor to foul the field unit. The new clutches and clutch/couplings are available in the range SF.160, 250 and 400 and have the same maximum static torque as the flange mounting units, i.e. 8, 60 and 240 lb-in static torque respectively.

Squirrel-Cage Motors

A range of totally-enclosed, fan-cooled, squirrel-cage motors with Class E insulation and complying with Draft B.S. A(ELE)1629 has been introduced by the GENERAL ELECTRIC CO., LTD., Rotating Plant Division, Witton, Birmingham, 6. Motors of up to 7½ h.p. at 1,500 r.p.m., and 5 h.p. at 1,000 r.p.m., are immediately available from stock; sizes up to 40 h.p. will be avail-

able shortly. These "D" frame machines have a continuous maximum rating in accordance with B.S. 2613 for a temperature rise of 65°C in ambient temperatures up to 40°C. They are interchangeable with ventilated machines ("C" frames) of the same rating complying with B.S. 2960.

Diffused Lighting Panels

New coloured 2ft and 3ft diffusing panels, for use in lumenated module lighting systems, are announced by LUMENATED CEILINGS, LTD., Alliance House, Caxton Street, London, S.W.1.

Yellow, green, red and blue translucent plastic diffusing modules are now available, and further colours will be added later according to demand. Apart from their colour, the modules are identical with the standard white lumenated module, type 2SA, and are fitted in the same way into the fluted light-alloy supporting track. The modules can be easily removed, rearranged or replaced.

A further innovation announced by the company is the "Highlight" module, either white or coloured, which carries a recessed spotlight in the centre. It can be fitted with any type of vertical or directional spotlight up to 100 W to emphasise a special display or feature. The leads are concealed behind the translucent

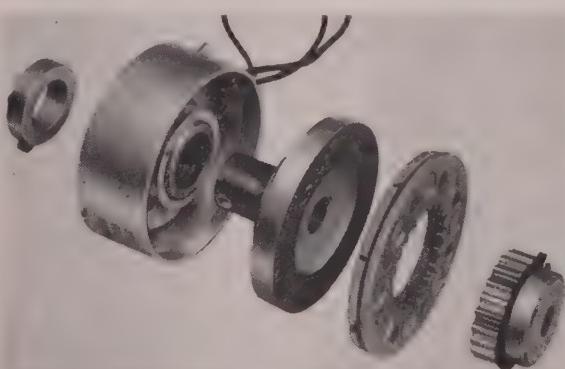
modules. When displays are changed the directional spotlights can be adjusted from below or the entire module can be removed.

Flexible Varnish

A silicone resin, R.212, has been developed by I.C.I., LTD., Millbank, London, S.W.1, as a coating and bonding varnish for electrical insulation components that have to operate at Class H temperatures. With fast curing time and good flexibility, this resin is well suited for coating glass-cloth. A relatively high solids content at low viscosity gives efficient penetration and saturation of asbestos and mica papers. Speed in wetting-out, short drying time and good adhesion make R.212 a suitable bonding agent for mica splittings and for glass/mica combinations.

Aluminium Melting and Holding Furnaces

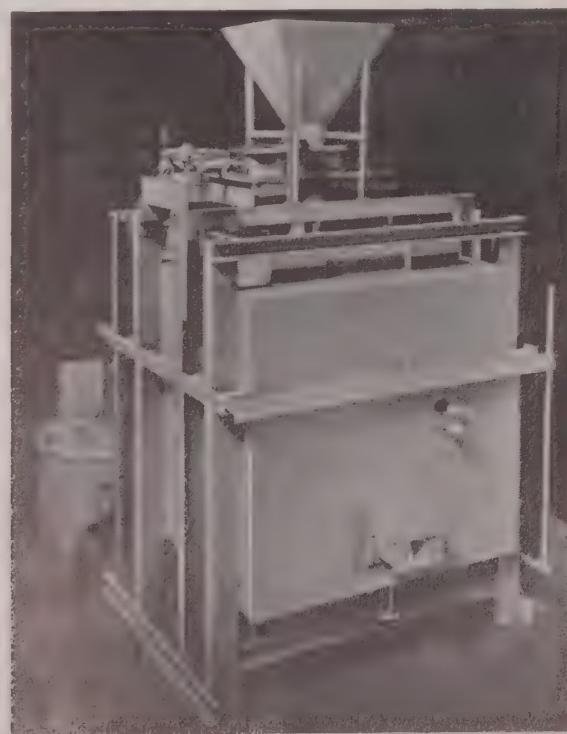
A dry hearth, aluminium melting furnace with a companion holding furnace, both of American design, are now being made in this country by the ELECTRIC RESISTANCE FURNACE CO., LTD., Netherby, Queens Road, Weybridge, Surrey. The two furnaces form a central installation for melting up to 500 lb of aluminium an hour, which can be ladled direct from the holding furnace or tapped off and



Westool electromagnetic clutch



G.E.C. squirrel-cage
t.e.f.c. motor



EFCO aluminium melting and holding furnaces



Rowlands Electrical Accessories No. 1231
floodlighting lantern



Sciaky four-channel spot welding controller



Plieger "Trident" home laundry unit

delivered hot to other holding furnaces.

The aluminium scrap is preheated in the hopper and melted in a vertical cylindrical muffle heated externally by silicon carbide elements. To prevent oxidation, the aluminium is melted and held at temperature in an atmosphere of high purity dry nitrogen. The furnaces can be arranged for operation on standard single- or three-phase supplies. The melting furnace is rated at 100 kW; the holding furnace has a capacity of 1,500 lb and a rating of 20 kW.

Floodlighting Lanterns

Two new floodlighting lanterns suitable for use with 250/400 W MBF/U colour corrected mercury lamps are announced by ROWLANDS ELECTRICAL ACCESSORIES, LTD., R.E.A.L. Works, Hockley Hill, Birmingham, 18. One (No. 1231) is an upward lighting model with a parabolic asymmetric reflector for short or medium range floodlighting. It is supplied with a control gear box and is priced at £23 15s.

For downward lighting a symmetric parabolic reflector is mounted in an adjustable frame and this can be supplied either with wall brackets or with clamps for pole mounting. The price of this model (No. 1235), with wall bracket, is £19 15s. Pole clamps and focusing devices are available at extra cost.

Spot Welder Control

A four-channel spot welder control unit of the fully synchronous, digital type is announced by SCIAKY ELECTRIC WELDING MACHINES, LTD., Slough, Bucks. Named the "Synchrosport," the unit is suitable for use with any spot or projection welder and will permit welding at speeds in excess of 750 spots per minute. Phase-shift heat control is incorporated.

The controller is composed of a four-stage dekatron timer, a heat control and an ignitron contactor all housed in a fabricated cabinet occupying a floor area of only 12in by 18in. The dekatron timer and the heat control are contained in separate chassis, with all connections made through plugs and sockets. These chassis are mounted on slides for easy removal. The unit has four synchronous time ranges of 1-90 c/s of squeeze, weld, hold and off and contains the complete machine control circuit including all initiation relays and air valve rectifiers.

Domestic Home Laundry

A compact home laundry unit which combines in a single 8½ gal capacity tub all the functions of washing, rinsing and spin drying, is now being

distributed by PLIEGER (LONDON), LTD., 6, Chandos Street, Cavendish Square, London, W.1. The machine, called the "Trident," is 31in high by 18in square and weighs 129 lb. A 3 kW heater and pilot light are fitted and other features include a built-in centrifugal pump operating simultaneously with the agitator and a double safety lid with a vitreous enamelled working surface. The washing action is claimed to be unusual because the agitator, being fixed to the washing tub, drives the water through the clothes and not the clothes through the water. The price, including purchase tax, is £72 9s.

Deep-Freeze Refrigerators

All but the smallest models in the 1960 "Frimatic" range of French-made domestic refrigerators, distributed in this country by EDMUNDSONS SUPPLY CORPORATION, LTD., 240-250, Ferndale Road, London, S.W.9, will incorporate a deep-freeze compartment.

The unit, built neatly into the top section of the refrigerator, has two levels and a fully-insulated base and door. Rapid freezing facilities are provided in the top half while the lower level stores frozen foods for any period and is also large enough to accommodate bottles. The prices of the new deep freeze models range from 69 gns (5 cu ft) to 120 gns (9.25 cu ft), including purchase tax.

Platinum Plating Solution

A stable platinum plating solution from which bright, heavy deposits may be obtained is now available from JOHNSON, MATTHEY & CO., LTD., 73-83, Hatton Garden, London, E.C.1. This bath, known as DNS platinum plating solution, is based on the complex sulphato-dinitrito-platinous acid, $H_2Pt(NO_2)_2SO_4$. The bath is acidic and may be used for electrical components and printed circuits. Platinum from DNS solution can be deposited directly on to copper, brass, silver, nickel, aluminium and titanium. For deposition on tin, zinc, cadmium or steel, an undercoat of silver or nickel is necessary. The solution is supplied as a concentrate containing 10 gm of platinum per 100 ml of solution. For general use this should be diluted to 5 gm of platinum per litre. Glass, earthenware or plastic tanks should be used. The character of the deposits remains unchanged in the temperature range 30 to 70°C but the recommended operating temperature is 50°C. At a current density of 5 A/sq ft, and at 50°C, the deposition rate is 0.0001 in in two hours.

Radiant Hotplate Development



In this cut-away view of the Hotpoint "Halo" 8in radiant ring the details of construction and shape of element can be clearly seen

IT has been estimated that in most homes approximately 80 per cent of the cooking is carried out on the hotplate of the cooker. Electric cooker manufacturers are obviously aware of this fact and, as a result, most present-day electric cookers are equipped with quick-heat boiling plates—either the light gauge solid type or tubular sheathed radiant rings. They realise that if the sales gap between electric and gas cookers is to be further narrowed, it is in speed of heating on the hob that future development will have to be concentrated, for it is here that the greatest sales resistance is to be found.

One of the pioneers in the development of radiant rings was Hotpoint (now A.E.I.-Hotpoint, Ltd.). Just over 30 years ago they introduced their first fully enclosed sealed mineral-insulated element, the essence of which was the centralising of a helical resistance winding within a protective sheath or tube filled with magnesium oxide. Since that time, development has continued steadily and 8in diameter rings of 1,600 W, 1,800 W and improved contact single-heat types of 2,000 W loadings, have been progressively produced. The speed of boiling and re-heating has increased and the amount of residual heat reduced by improved heat dissipation and lower thermal mass. Now, as a result of manufacturing improvements and the

use of a superior grade magnesium oxide, a 2,300 W 8in radiant ring with a performance claimed to equal that of a standard gas ring has been produced. The new ring, the Hotpoint "Halo," with a smaller 6½in version (loading 1,350 W) are to be placed on the market immediately.

Whilst heating times are of great importance, so too are the residual heat and cooling times. In this respect the reduced thermal mass of the new ring provides close temperature and simmering control with quick re-heat where necessary. Whereas immediately after the war the weight per inch of tube length was 0.262 oz, the comparable weight now is 0.109 oz. This reduction to 41.5 per cent of thermal mass not only increases the operating effectiveness and speeds heating times, but also reduces the residual heat and cooling time to give finer regulation in use.

Advantages are also claimed for the flattened section shape of the ring, which gives an increased surface contact area. Compared with previous types, which had four turns of coil, the "Halo" has six turns and a longer element, giving a nominal contact area of 15.1 sq in on the 8in ring, an increase of 70 per cent.

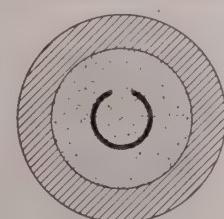
"Inconel" tubing is used for the sheath and with triple-compacted electrical insulation between this and the 80/20 nickel-chrome spiral, pro-

duction tests on the "Halo" element show average mean leakage current figures of 0.3 mA for the 8in ring. B.S. 744:1954 specifies that the mean leakage current shall not exceed 10 mA.

Performance tests carried out with the 8in "Halo" indicate that the respective times taken to raise the temperature of one pint of water from cold to boiling were 3 min 19 sec (vitreous enamelled steel vessel) and 3 min 40 sec (ground base aluminium vessel). Apart from the advantages of this rapid operation, the running costs of the "Halo" are also claimed to be lower. The resiliency of the coils allows them to follow closely the distortion normal to the base of cheaper aluminium vessels, which can quite satisfactorily be used.

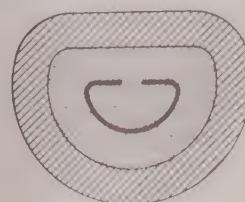
Both the 8in and 6½in rings conform to the E.D.A. interchangeability standard and are available for "Simmerstat" or three-heat control. The respective high, medium and low loadings are 2,300, 1,245 and 572 W (8in) and 1,350, 580 and 337 W (6½in). The undercarriage assembly includes a blue vitreous-enamelled support plate and the aluminium reflector has been designed with a central well to carry spillage away from the element.

The standard voltage ranges are 200/210, 220/230, 230/240 and 250 V and all rings are guaranteed for two years from the date of installation.



TYPE MA

CIRCULAR TUBE
THICK WALL
LOW CONTACT AREA



TYPE MD

FLATTENED TUBE
THICK WALL
IMPROVED CONTACT AREA
4 COIL SURFACES OF CONTACT



TYPE AA

D-SHAPED RESILIENT TUBE
THINNER WALL—REDUCED MASS
IDEAL CONTACT AREA
6 COIL SURFACES OF CONTACT

Element section comparisons between the immediate post-war element, type MA, through the intermediate type, MD, to the present type, "Halo" AA.800, graphically illustrates the advancement

Coal Production Decline

N.C.B. ANNUAL REPORT

THE main task of the National Coal Board in 1959, according to the annual report and accounts for the year ended 2nd January last (H.M. Stationery Office, 3s 6d), was to regulate output to conform with the fall in consumption. The total output of saleable coal was 206.1 million tons, including 10.8 million tons from opencast working; this was 9.7 million tons less than in 1958. At the end of the year, undistributed stocks amounted to 36 million tons and their stocking is estimated to have cost some £27 million. Productivity was 5.3 per cent higher than in 1958, reaching the record level of 1,332 tons per worker per shift. The operating profit for the year amounted to £13.1 million but after deducting £37.1 million for interest charges the deficiency for the year was £24 million. Capital expenditure amounted to £112 million compared with £104 million in 1958. Non-operational expenditure, which covers administration, research, education and similar activities, was reduced to £70.9 million from the previous year's figure of £73.6 million.

The coal industry did not fully benefit from the revival of industrial activity during the year, coal consumption being some 12½ million tons less than in 1958. The report states that although electricity generating stations produced some 7 per cent more power, their coal consumption declined by 0.2 million tons to 46 million tons, due mainly to an increase in oil consumption by 2.7 million tons to 7 million tons in terms of coal equivalent. During the year an agreement was reached with the Central Electricity Generating Board and an oil company to defer for one year the conversion to oil firing of boilers at two power stations, but negotiations for converting dual fired stations back to coal had not been successful.

The estimated coal consumption for 1960, assuming normal temperatures during the year, will be about 196 million tons, including exports. To avoid stocking, the maximum outputs are planned to be 188 million tons of deep-mined coal and 7 million tons extracted by opencast mining. For some Welsh anthracite and low volatile coals there is, however, an unsatisfied demand, and additional

supplies will be obtained if possible. Reduction in deep-mined output will be achieved partly by closing about 45 of the total of 536 licensed mines, with a current annual output of 4.8 million tons, and partly by closing coal faces or districts in some mines and working others on only one shift per day.

The three pilot systems of electronic data processing made good progress in 1959. The installation in the North Staffs Area has taken over the paybill of the 22,500 men employed at the collieries and plans are in hand to add the salaries of 2,000 non-industrial staff, while that in the South West Durham Area is processing wages for over 10,000 men. The wider application of electronic data processing to general accounting, statistics and other work has been considered and the Board is investigating the possibility of establishing one installation in each Division to provide an integrated data processing service for several Areas.

Although the decision that further expenditure on underground gasification trials would not be justified was taken towards the end of 1958, those in progress were completed. The trial using an open borehole technique was successful, producing sufficient gas to operate a small power station constructed at Newman Spinney by the C.E.G.B. A full report on the work carried out will be published this year but a preliminary assessment of the results indicates that underground gasification is not a sound commercial proposition in this country.

The Board has 250 student apprentices studying mining, mechanical and electrical engineering, while the "ladder plan" provides for part-time technical education of selected young mine workers and apprentices, mainly by release to attend technical colleges one day each week, but also for more advanced students by sandwich courses or a one-year full-time course. Enrolments to study electrical engineering under this plan in 1959 included some 3,860 applicants possessing General and Advanced General Certificate, 1,632 possessing Ordinary National Certificate and 425 with Higher National Certificate and other advanced qualifications.

Turbine Stress-Relieving

STRESSES in the bottom-half turbine exhaust casing of a 200 MW turbo-generator, one of two being manufactured at the Erith Engineering Works of the General Electric Co., Ltd., for extensions to the Kincardine generating station of the South of Scotland Electricity Board, have been relieved by means of radiant electric heating. The bottom-half turbine exhaust casings for these machines were fabricated as complete units. Previously the casings have been made in sections which were stress-relieved in conventional furnaces. Each of the Kincardine casings is 47 tons in weight with overall dimensions of 21ft 3in by 17ft by 8ft 3in high. Owing to the amount of metal and the complicated nature of the structure, it was necessary to use 68 single-phase 7½ kW radiant heating elements. The heaters were arranged to ensure even heating, and each could be individually controlled. The casing was placed on a fire-brick base and most of the heating elements were suspended vertically inside, although a number were floor-mounted. After covering the open top with a ½in steel plate, the whole structure was encased in a 6in depth of thermal insulation.

Forty-two thermocouples were connected to seven 6-point graphic recorders for temperature measurements. When the temperature reached 650°C, the power input was reduced to keep the temperature constant while the casing "soaked" for three hours. The heaters were then switched off and the casing was allowed to cool.

The power supply for the process, totalling 510 kW, was taken from a 750 kVA transformer feeding a busbar system at 400 V through a 1,000 A switch-fuse. Although in this instance the heaters were controlled manually, the arrangement is well suited for automatic control.

I.E.E. SCOTTISH CENTRE DIAMOND JUBILEE

A booklet entitled "Jubilee Recollections" has just been published by the Scottish Centre of the Institution of Electrical Engineers to commemorate the founding of the Centre in 1899. The booklet contains two articles: "The First Fifty Years," by Donald Smeaton Munro, and "The Last Decade," by E. Openshaw Taylor.

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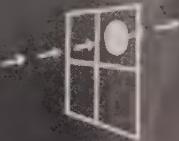
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Three views from a 3,000 frame/sec cine film of the fuse operation

FUSE-SWITCH UP-RATED

TESTED FOR 150 MVA AT 11 KV

A RESEARCH and testing programme during the past year has resulted in an increase in the interrupting capacity of the Johnson & Phillips type D fuse-switch and the unit has now been certified for a three-phase breaking capacity of 150 MVA at 11 kV. The original fuse was designed in 1934, since when some 250,000 have been supplied, and assigned an interrupting capacity of 50 MVA. After initial tests, however, 100 MVA was obtained but without the reliability associated with circuit-breakers. During the recent study of arc-control phenomena, comparatively minor changes in design enabled the new interrupting capacity to be obtained with complete reliability.

A series of frames from a high-speed film taken on a camera capable of recording 3,000 frames per second during short-circuit tests at the C.E.S.I. Laboratories, Milan, are reproduced. The first frame shows the element melted, and the left-hand fuse commencing gas expulsion at 0.0007 sec. In the second, gas expulsion has begun on the right-hand fuse-switch at 0.002 sec, and in the third the gases have dispersed and the circuit is open at 0.014 sec. Further frames showed that the fuse carrier was about to swing down to indicate a blown fuse at 0.017 sec. The tests, in accordance with B.S. 2692, were made on a three-phase circuit comprising two expulsion fuse-switches with a short-circuiting link in the third phase to ensure that the recovery voltage across each phase was not less than the line-to-line voltage. They were successful and resulted in the granting of

certificates by the laboratories for operation at all current values up to 8,000 A.

The new units are available with 22 kV porcelain insulators providing line insulation for ordinary purposes or with 62 kV porcelain insulators

for use where an extra high level of line insulation is required. The unit is installed by a single-bolt fixing through a galvanised malleable iron base to which the upper and lower parts of the fixed portion of the switch are fitted. The fuse link tube is of synthetic resin bonded paper and is open at both ends to facilitate the rapid dissipation of pressure at all current values. The tube fittings consist of a latch-in trigger assembly and contact at the upper end and a trunnion bearing and contact at the lower. Both ends are fitted with brush type phosphor bronze contacts which provide a positive high-pressure multi-line connection and current carrying is independent of the trunnions, bearings and trigger. The fuse element is carried inside the link tube and holds the switch in its latched position while the element is intact. When the fuse blows the latch-in trigger is released which allows the switch to swing down to the isolated position, indicating an interruption in the supply. Existing units of lower rating may be modified by fitting a new tube and bottom contact to increase the capacity to 150 MVA.

Computing Machines for Reactor Studies

A FIVE-DAY International Seminar on Codes for Reactor Computations, held in Vienna by the International Atomic Energy Agency, was attended by nearly 100 experts from 20 countries. The European Nuclear Energy Agency of the O.E.E.C. and the Euratom were also represented. Discussions indicated how computing machines could be used more widely and effectively for calculations during the design and operation of reactors. Thirty-seven papers on six main topics were presented and discussed.

An account of the existing facilities for reactor computations in different countries was given, and the techniques of utilising low and high speed computers for reactor problems as well as numerical and statistical methods were discussed. Existing and planned libraries of reactor codes were also considered. The possibility of establishing a universal machine language to facilitate coding and to achieve interchangeability of codes and avoid duplication of work was also considered. The proceedings will be published by the I.A.E.A.



J. & P. 150 MVA fuse-switch
in the closed position

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1956

6693. Burroughs Corporation.—Electronic computer system. 2nd March, 1956. (835243.)

8097. Simon-Carves, Ltd.—Electrostatic precipitators. 8th February, 1957. (835012.)

10173. Brown, Boveri & Cie. A.G.—High voltage transformer winding with means for protection against damage by steep wave front potentials. 3rd April, 1956. (835222.)

11677. British Electrical & Allied Industries Research Association.—Vacuum electric switches. 3rd April, 1957. (835253.)

11970. Electrocircuits, Inc.—Ultrasonic coupling apparatus. 19th April, 1956. (835254.)

12855. National Research Development Corporation.—Cathode-ray tubes. 26th April, 1956. (835112.)

13001. General Electric Co.—Stabilised liquid dielectric materials. 27th April, 1956. (835255.)

15402. Egyesült Izzolampa es Villa-Mossagi R.T.—Circuit arrangements for amplifying voltages of very high frequency. 17th May, 1956. (835256.)

15669. Parsons & Co., Ltd., C. A.—Nuclear reactors. 17th May, 1957. (835257.)

15822. Domecq, J. L.—Apparatus for protection of electrical equipment. 22nd May, 1956. (835019.)

17479. Kubin, P.—Magnetically operated electric circuit-breaker, more particularly for electromagnetic petrol pumps in motor vehicles. 6th June, 1956. (835258.)

17497. General Electric Co.—Image reproducing or picture cathode-ray tubes. 6th June, 1956. (835117.)

17695. Siemens-Schuckertwerke A.G.—Apparatus for indicating the speed of rotation of rotating parts. 7th June, 1956. (835020.)

18142. Etablissements G. Decombe.—Method and means for continuously unwinding at a high speed electric and like wires wound over spools. 12th June, 1956. (835262.)

18256. Deutsche Katadyn G.m.b.H.—Electrodes for electro-oligodynamic apparatus. 13th June, 1956. (835414.)

19383. Rank Cintel, Ltd.—Apparatus for controlling line-by-line scanning processes. 21st June, 1957. (835022.)

19425. British Thomson-Houston Co., Ltd.—High frequency generators of the travelling wave type. 21st June, 1957. (835417.)

19487. Siemens-Schuckertwerke A.G.—Ion source. 22nd June, 1956. (835118.)

21196. General Electric Co.—Nuclear reactors. 9th July, 1956. (835266.)

21572. Telefunken G.m.b.H.—Push-button operated electrical switch assemblies. 12th July, 1956. (835119.)

21728. Mullard Radio Valve Co., Ltd.—Electronic discharge tubes. 24th June, 1957. (835418.)

21753. Compagnie Française Thomson-Houston.—Electric discharge devices. 13th July, 1956. (835023.)

22628. Hick, Hargreaves & Co., Ltd., and Arrowsmith, R. M.—Steam condenser installations for steam turbine power plant. 4th June, 1957. (835419.)

23436. Philco Corporation.—Cathode-ray tube apparatus. 30th July, 1956. (835025.)

24693. Ajax Electric Co.—Laminated electrode for a salt bath furnace. 13th August, 1956. (835123.) 27121. Electric salt bath furnaces and electrodes therefor. 5th September, 1956. (835126.)

25131. General Electric Co., Ltd.—Electric switching or selecting devices. 16th August, 1957. (835424.)

26099. Standard Telephones & Cables, Ltd. (Nippon Electric Co., Ltd.).—Periodic magnetic electron beam focusing arrangement. 27th August, 1956. (835271.)

26110. Marsal, M.—Cable terminal for high and super tension cables. 27th August, 1956. (835124.)

27122. International Business Machines Corporation.—Transistors and their manufacture. 5th September, 1956. (835028.)

29004. Siemens & Halske A.G.—Magnetic flux guides and travelling-wave tube arrangements. 21st September, 1956. (835029.)

29896. Siemens & Halske A.G.—Apparatus for measuring in digital form constantly varying electric currents or voltages. 1st October, 1956. (835436.)

30354. Decca Record Co., Ltd.—Radio transmitting and receiving systems. 30th September, 1957. (835274.)

31487. Bendix Aviation Corporation.—Magnetic electron multiplier. 16th October, 1956. (835129.)

33427. Sylvania Electric Products, Inc.—Discharge lamp and phosphor therefor. 1st November, 1956. (835034.)

34693. Babcock & Wilcox, Ltd.—Metallic tubes with extended heat-transfer surfaces. 12th November, 1957. (835445.)

35579. Philco Corporation.—Computer circuits. 21st November, 1956. (835036.)

37387. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Means for the wetting of the electrodes of electrostatic precipitators. 6th December, 1956. (835042.)

37553. United Kingdom Atomic Energy Authority.—Induction heating apparatus. 27th November, 1957. (835278.)

39482. General Electric Co.—Automatic control systems of the feedback type for variable speed electric motors. 28th December, 1956. (835046.)

1957

1438. Automatic Telephone & Electric Co., Ltd.—Electrical key switches and indicators therefor. 19th December, 1957. (835048.)

4630. British Telecommunications Research, Ltd.—Electronic switching devices. 10th February, 1958. (835050.)

7266. Westinghouse Electric Corporation.—Electrical members provided with organopolysiloxane insulation. 5th March, 1957. (835139.)

15242. Easan Electrical (Proprietary), Ltd.—Electrical regulating systems. 6th May, 1958. (835304.)

15926. Marconi's Wireless Telegraph Co., Ltd.—Radio direction finders. 21st February, 1958. (835059.)

16118. General Electric Co., Ltd.—Low pressure mercury vapour fluorescent electric discharge lamps. 20th May, 1958. (835144.)

16973. British Broadcasting Corporation.—Variable electrical attenuators. 28th May, 1958. (835307.)

17875. United Kingdom Atomic Energy Authority.—Fluid circuits, e.g. of nuclear reactors. 16th May, 1958. (835145.)

18099. Smith & Sons (England), Ltd., S.—Electrical signal transmission systems. 2nd July, 1958. (835462.)

18417. Sulzer Freres S.A.—High pressure steam power plants. 11th June, 1957. (835308.)

20030. Thorn Electrical Industries, Ltd.—Transformers and the like. 27th May, 1958. (835147.)

21550. Marconi's Wireless Telegraph Co., Ltd.—Rotatable coaxial feeder joints. 12th March, 1958. (835148.)

22091. Bosch G.m.b.H., R.—Electrical generator regulating systems, especially for mechanically propelled vehicles. 12th July, 1957. (835210.)

22974. Engel & Gibbs, Ltd.—Process and means for the protection of apparatus such as electric conducting liquid switches, and thermometers. 13th May, 1958. (835149.)

24429. British Thomson-Houston Co., Ltd.—Electrical transformers. 4th July, 1958. (835318.)

25267. Standard Telephones & Cables, Ltd.—Electrolytic capacitors. 8th August, 1958. (835076.)

26160. Remix Radiotechnikai, V.—Paper dielectric material. 19th August, 1957. (835078.)

26879. Compagnie Française Thomson-Houston.—Telemetering equipment. 26th August, 1957. (835080.)

27116. A.E.I.-John Thompson Nuclear Energy Co., Ltd.—Nuclear reactors. 14th August, 1958. (835326.)

29378. Pressac, Ltd.—Electric plug and a method of constructing same. 12th September, 1958. (835085.)

29559. Soc. des Accumulateurs Fixes & de Traction.—Electric cells. 19th September, 1957. (835086.)

29655. Sperry Gyroscope Co., Ltd.—Magnetic amplifiers. 1st August, 1958. (835087.)

29890. Shand & Jurs Co.—Electrical control system and apparatus. 23rd September, 1957. (835332.)

30638. Standard Telephones & Cables, Ltd.—Method of manufacture of capacitors. 1st October, 1957. (835091.)

30694. Siemens Edison Swan, Ltd.—Electromagnetic sounders or ringers for giving audible calling signals. 22nd September, 1958. (835156.)

31275. Lucas (Industries), Ltd., J.—A.c. generators. 12th September, 1958. (835333.)

31302. Compagnie Générale de Télégraphie sans Fil.—Shielded sandwich form hybrid ring strip circuits for microwave transmission lines. 7th October, 1957. (835475.)

32422. Allmanna Svenska Elektriska A.B.—Remote metering by means of impulse series. 17th October, 1957. (835095.)

35690. Metropolitan-Vickers Electrical Co., Ltd.—Electrical pulse generators. 15th December, 1958. (835162.)

36260. Cole, Ltd., E. K., and Wall, N. E.—Transistor amplifier circuits. 21st November, 1958. (835337.)

38259. General Electric Co., Ltd.—Thermionic electrodes and electric discharge lamps. 9th December, 1958. (835343.)

38497. Marconi's Wireless Telegraph Co., Ltd.—Echo sounders. 28th July, 1958. (835491.)

38798. Western Electric Co., Inc.—Electric cables and methods of making them. 13th December, 1957. (835348.)

40326. Burgess Products Co., Ltd.—Actuators for electrical switches. 30th December, 1957. (835494.)

1958

117. M-O Valve Co., Ltd.—Electrostatic focusing devices. 9th December, 1958. (835350.)

196. Philips Electrical Industries, Ltd.—Potentiometers. 12th December, 1958. (835495.)

2506. Siemens-Reiniger-Werke A.G.—Electric time switch arrangements for electrical apparatus. 24th January, 1958. (835352.)

4722. Compagnie Générale de Télé-

[Continued on page 1045]

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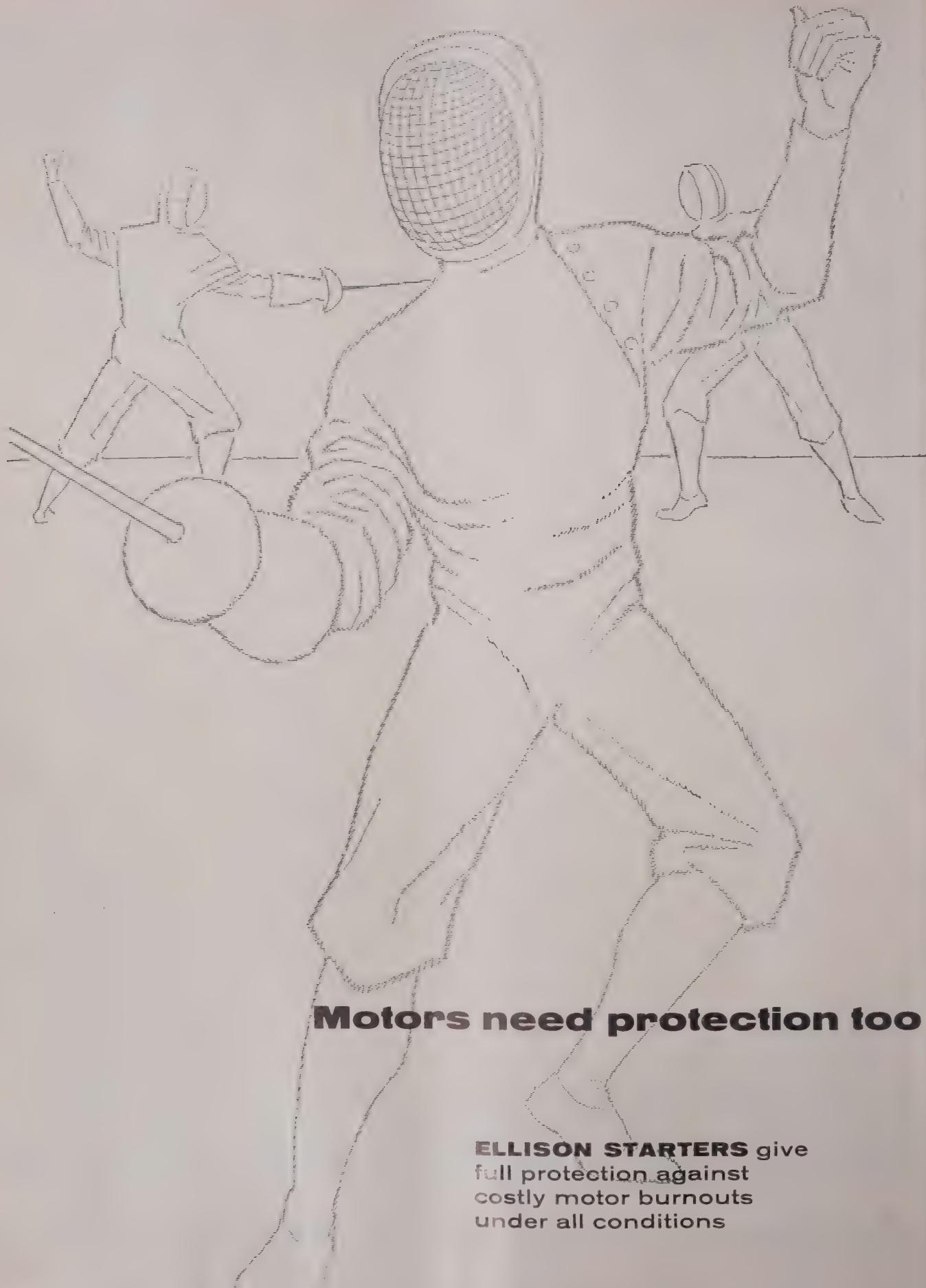
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NEW PATENTS (continued)

graphie sans Fil.—Permanent magnet constructions. 13th February, 1958. (835173.)

8777. Westinghouse Electric Corporation.—Electrical control apparatus. 19th March, 1958. (835509.)

10466. Siemens & Halske A.G.—Coordinate switching arrangements. 1st April, 1958. (Addition to 798272.) (835180.)

10500. Telemecanique Electrique.—Electromagnetically controlled reversers for electric motors. 1st April, 1958. (834963.)

11465. Sylvania Electric Products, Inc.—Semiconductive translating devices and methods. 10th April, 1958. (835851.)

11544. Fernseh G.m.b.H.—Television cameras. 11th April, 1958. (834741.)

12892. Western Electric Co., Inc.—Production of thin metallised sheets of dielectric material. 23rd April, 1958. (834744.)

14047. Westinghouse Electric Corporation.—Television receivers having an inter-carrier sound system and automatic frequency control. 2nd May, 1958. (834630.)

14082. Philips Electrical Industries, Ltd.—Low pressure mercury vapour discharge tubes. 2nd May, 1958. (835183.)

14091. Siemens-Schuckertwerke A.G.—Forced-flow steam generators. 2nd May, 1958. (Addition to 779335.) (835367.)

15453. Westinghouse Electric Corporation.—Television receivers having inter-carrier sound systems and automatic frequency control. 14th May, 1958. (835184.)

15962. Basic Products Corporation.—A.C. supply apparatus for electric discharge devices. 19th May, 1958. (835371.)

17122. Standard Telephones & Cables, Ltd. (Lorenz A.G., C.).—Method for the frequency synthesis in duplex radio sets. 29th May, 1958. (834636.)

17229. Brown, Boveri & Cie. A.G.—Nuclear reactor with gas cooling. 29th May, 1958. (834978.)

17803. Brown, Boveri & Cie. A.G.—Method of producing a wound stator for a dynamo-electric machine. 4th June, 1958. (835376.)

18480. General Motors Corporation.—Lever operable electrical switch and contact arrangement therefor. 10th June, 1958. (834752.)

18525. Philips Electrical Industries, Ltd.—Indicator devices. 10th June, 1958. (835527.)

18889. Seybold, R.—Means for adjusting the tones in electronic musical instruments. 12th June, 1958. (835663.)

19264. Krumm, J. L.—Electric plug and socket connectors. 16th June, 1958. (834754.)

19297. Comptoir de l'Industrie Cotonnière, Etablissements Boussac.—Electrical power plant for treating strip material. 17th June, 1958. (835381.)

19830. Standard Telephones & Cables, Ltd.—Diversity receiver system. 20th June, 1958. (834979.)

19841. Blackburn Group, Ltd., and Mullenex, P. A.—Gravity controlled electric switches. 20th June, 1958. (834756.)

20078. Autophon A.G.—Magnetic scanning device particularly for use in telephone substations. 23rd June, 1958. (834544.)

20218/9. Philips Electrical Industries, Ltd.—Electrolytic capacitors. 24th June, 1958. (834648 and 835861.)

20879. Telecommunications S.A. de.—Methods and apparatus for the production of telecommunications cables and to telecommunications cables when produced by such methods and apparatus. 30th June, 1958. (835188.)

22950. Westinghouse Electric Corporation.—Refrigeration apparatus. 17th July, 1958. (835190.)

23454. Standard Telephones & Cables, Ltd.—Crystal rectifiers and methods of manufacture thereof. 22nd July, 1958. (835865.)

25010. Bruck, A.—Means for securing electric jugs and the like against displacement. 5th August, 1958. (835533.)

27179. General Electric Co.—Ionic vacuum pumps. 25th August, 1958. (834655.)

29140. Philips Electrical Industries, Ltd.—Symmetrical current circuits fed by direct current. 11th September, 1958. (835534.)

34189. Sylvania Electric Products, Inc.—Image storage device. 24th October, 1958. (834768.)

31991. Telefonaktiebolaget L. M. Ericsson.—Identification apparatus for identifying a calling subscriber's station in a telecommunication system. 7th October, 1958. (834994.)

32900. General Electric Co.—Thyratron discharge devices. 15th October, 1958. (835400.)

34041. Ericsson Telephones, Ltd.—Magneto bells. 24th October, 1958. (834995.)

34306. General Electric Co.—Internal magnetic deflection system for electron beam generator. 27th October, 1958. (834996.)

34931. Telefunken G.m.b.H.—Circuit arrangements for generating sawtooth currents. 31st October, 1958. (Addition to 814969.) (834772.)

39306. Standard Telephones & Cables, Ltd.—Electrode for electric discharge devices. 5th December, 1958. (834779.)

39884. Compagnie Française Thomson-Houston.—Fluid-tight seals for waveguides. 10th December, 1958. (835000.)

40344. Philips Electrical Industries, Ltd.—Cathode-ray tubes for colour reproduction. 15th December, 1958. (835688.)

1959

1391. Mullard, Ltd.—Travelling wave tubes. 14th January, 1959. (834780.)

2053. Element, Ltd.—Methods of and furnaces for melting and refining glass electrically. 12th April, 1956. (Divided out of 835202.) (835205.)

24263. Bosch G.m.b.H., R.—Electrical generator regulating systems, especially for mechanically propelled vehicles. 12th July, 1957. (Divided out of 835210.) (835211.)

31275. National Presto Industries, Inc.—Thermostatic control means for an electrically heated device. 2nd February, 1956. (Divided out of 834407.) (834408.)

TRADE MARK

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 18th June:—

Airmaster. No. B799,616. **Speedmaster.** No. B799,617. Class 7. Electrically and pneumatically operated hand-guided tools.—Selecta Power Tools, Ltd., Victoria Works, Victoria Road, Willesden, London, N.W.10.

Spectophon. No. B790,563. Class 9. Electronic radio apparatus and parts; and sound amplifiers (not for surgical or medical purposes).—Symphony Amplifiers, Ltd., 42, Tottenham Street, London, W.1.

Con Hex (design). No. 791,520. Class 9. Electrical and electronic apparatus and instruments, and parts.—Sealectro Corporation, Mamaroneck, N.Y., U.S.A. Address for service, c/o Boult, Wade & Tennant, 112, Hatton Garden, London.

Cedco. No. 798,843. Class 9. Switch-gear; electric conduit materials; and wires, cables, and electric fittings.—Claremont Electrical Distributing Co., Ltd., 18, Cricklewood Broadway, London, N.W.2.

APPLICATIONS

Double Eagle. No. 799,839. Class 9. Electrical sound recording and sound reproducing apparatus and instruments; and media prepared for use in recording and reproducing sound.—R. J. Barton, 29b, Randolph Crescent, London, W.9.

Fabilite. No. 793,925. Class 11. Lampshades, electric light fittings and parts, but not including electric lighting fittings for vehicles.—Fabilite, Ltd., 13-17, East Dulwich Road, London, S.E.22.

Ruton (design). No. 797,849. Class 11. Domestic apparatus, heating apparatus, and hair drying apparatus, all being electric; refrigerators, and parts.—Electrische Apparaten en Metaalwarenfabrieken Rudolf Blik N.V., The Hague, Netherlands. Address for service, c/o Withers & Spooner, 148, Holborn, London, E.C.1.

Electrux. No. 799,376. Class 11. Refrigerating chambers, refrigerating chests and refrigerators.—Electrolux, Ltd., Electrolux Works, Oakley Road, Luton, Beds.

Next Week's Events

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 13th JUNE

Bournemouth.—Grand Hotel, Firvale Road, 8 p.m. A.S.E.E. Bournemouth and District Branch. "The Work of the National Inspection Council," by E. J. Sutton.

Ilford.—Angel Hotel, 7.15 p.m. A.S.E.E. Essex Branch. Annual general meeting.

Leeds.—Great Northern Hotel, 7 p.m. A.S.E.E. Leeds Branch. Annual general meeting.

London.—White Hall Hotel, Bloomsbury Square, W.C.1, 6.30 p.m. A.S.E.E. Central London Branch. Annual general meeting.

Sheffield.—Royal Victoria Hotel, 7.30 p.m. A.S.E.E. Sheffield Branch. Annual general meeting.

Wembley.—Century Hotel, 7.30 p.m. A.S.E.E. North West London Branch. Annual general meeting.

MONDAY, 13th JUNE to FRIDAY, 17th JUNE

Blackpool.—Norbreck Hydro. Association of Mining Electrical and Mechanical Engineers. Annual conference.

TUESDAY, 14th JUNE

Canterbury.—County Hotel, 7.30 p.m. A.S.E.E. East Kent Branch. Annual general meeting.

Cardiff.—South Wales Institute of Engi-

neers, Park Place, 7.30 p.m. A.S.E.E. South Wales Branch. Annual general meeting.

Chester.—Westminster Hotel, City Road, 7 p.m. A.S.E.E. Chester and District Branch. Annual general meeting.

Eltham.—Eltham Green School, Queens-croft Road, S.E.9, 7.45 p.m. A.S.E.E. South East London Branch. Films evening.

London.—Connaught Rooms, W.C.2, 12.30 for 1 p.m. Electrical Industries Club. Luncheon.

New Forest.—Brockenhurst Manor Golf Club I.E.E. Southern Centre. Golf competition.

York.—Georgian House, Blossom Street, 7.30 p.m. A.S.E.E. York Branch. Annual general meeting.

WEDNESDAY, 15th JUNE

London.—Great George Street, Westminster, S.W. Institution of Civil Engineers. Conversazione.

WEDNESDAY, 15th JUNE to SATURDAY, 25th JUNE

Paris.—C.I.G.R.E. meeting.

FRIDAY, 17th JUNE

London.—32, Welbeck Street, W.1, 8 p.m. British Institute of Radiology. Radiobiology meeting.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Brisbane City Council, 29th July. 33 kV metalclad switchgear. (E.S.B. 13915/60.)*

Burma.—Controller of Stores, Rangoon, 18th July. 230 kV line materials. (E.S.B. 14548/60.)*

Durham.—County Council. Electrical installation in new health centre, Hardwick estate, Stockton-on-Tees. (See this issue.)

Hastings.—Corporation, 16th June. Electrical installation in College of Further Education. (See this issue.)

India.—Madras State Board, 29th June. 6,900 polyphase meters. (E.S.B. 14538/60.)*

Delhi Corporation, 11th July. 11 kV, 250 MVA switchgear. (E.S.B. 14544/60.)*

Kerala State Electricity Board, Trivandrum, 17th August. Power line carrier current equipment. (E.S.B. 14550/60.)*

Iraq.—Ports Administration, Basrah, 19th June. Electrical materials for 1.v. overhead lines. (E.S.B. 14504/60.)* 10th July. One thousand a.c. ceiling fans. (E.S.B. 14506/60.)*

Jordan.—Transjordan Electric Power Company, Amman, 2nd July. Two 5,000 kVA and two 250 kVA transformers. (E.S.B. 14570/60./D.L.F.)*

Libya.—Hycon-Page Libya, Tripoli, 18th June. Telephone wire and cable. (E.S.B. 14576/60./I.C.A.)*

Malaya.—Central Electricity Board, 2nd September. Transformers. (See this issue.)

New Zealand.—Auckland Harbour Board, 5th July. Submarine cables. (E.S.B. 14203/60.)*

Nigeria.—Electricity Corporation of Nigeria, 2nd July. H.v. switchboard. (See this issue.)

Portuguese East Africa.—Ports, Railways and Transport Department, Lourenço Marques, 31st August. Seven motor-generator sets for power stations. (E.S.B. 14250/60.)*

Rhodesia and Nyasaland.—Umtali Municipality, 6th July. E.h.v. switchboards. (E.S.B. 14589/60.)*

South Africa.—Pretoria Electricity Department, 21st June. Fifty 11,500/250 V, 15 kVA transformers. (E.S.B. 14211/60.)*

Stores Department, South African Railways, Johannesburg, 15th July. V.h.f. radio equipment. (E.S.B. 14546/60.)*

Sudan.—Central Electricity and Water Administration, Khartoum, 18th June. V.h.f. mobile radio equipment. (E.S.B. 14536/60.)*

Stores Department, Sudan Railways, Khar-

toum, 30th June. Submarine cable and cast iron protection boxes. (E.S.B. 14507/60.)*

Syria.—Director General Posts, Telephones and Telegraphs, Damascus, 2nd July. Three automatic telephone exchanges. (E.S.B. 14262/60.)* 4th July. Equipment for underground telephone lines. (E.S.B. 14263/60.)*

Director General, Major Project Adminis-

tration, Damascus, 4th August. Equipment for generating and pumping stations of the Sinn irrigation scheme. (E.S.B. 14254/60.)*

* This information is extracted from the Board of Trade Export Service Bulletin. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

ORDERS PLACED

Birmingham.—Regional Hospital Board. Recommended. Phase 6 of electrical re-wiring programme at St. Edward's Hospital, Cheddleton, Leek, Staffs (£4,930).—E. Holloway.

Durham.—County Council. Electrical installation for second instalment of new Consett fire station (£1,530).—North of England Engineering & Electrical Co.

Fife.—Electrical installation in naval establishment.—B. French.

Stoke-on-Trent.—City Council. Recommended. Electrical installation work at old people's home, Burton estate (£7,482).—Speed Electric Service (Stoke-on-Trent).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Aireborough.—Houses (100); surveyor, Micklefield House, Rawdon, near Leeds.

Aldridge.—Factory, off Northgate; S. Cox & Son, Lichfield Road, Walsall Wood, Staffs.

Alston (Cumberland).—Hotel, café and restaurant, Hartsdie; S. Talbot, Nent Hall, Alston.

Bath.—Extension to City College, Somerset Place (£45,000); education surveyor, 3, High Street.

Bedford.—Out-patients' and casualty departments, General Hospital; F. A. C. Maunder, architect, 40, Eastbourne Terrace, London, W.2.

Berkhamsted.—Dwellings (104), Westfield estate; R. E. Hulse, architect, Civic Centre.

Blackpool.—Block of five shops and offices, Abingdon Street/Birley Street site, for Timothy Whites & Taylors, Ltd.; staff architects, 70, Vauxhall Bridge Road, London, S.W.1.

Chester-le-Street.—Houses (122), Ouston; F. Bowman, R.D.C. architect, Estate Office, Birtley.

Croydon.—Works extensions; Funnell, Dyson & Gregory, Ltd., Dingwall Road.

Old people's home, Monks Hill estate (£65,000); borough engineer, Town Hall.

Darlington.—Shops, Northgate and Albion Street; Gillinson & Barnett, architects, 8, Queen Square, Leeds.

Dawley.—Old persons' home, Castle Lodge (£52,297); county architect, Column House, London Road, Shrewsbury.

Doncaster.—Police buildings and magistrates' courts, Civic Centre site; borough architect.

Durham.—Additional accommodation at Hatfield College; Thomas Worthington & Son, architects, 178, Oxford Road, Manchester.

Additions to Hebburn Technical College, Ryhope Grammar School, and Ryton Modern School, and new Jarrow Dunn Street School; county architect, South Street, Durham.

Eltham.—Extension to Avery Hill Training College (£250,000); D. D. Harrison, architect, 34, Holland Park Road, London, W.14.

Esher.—Extensions to Waynflete County Secondary School (£133,275); county architect, County Hall, Kingston-on-Thames.

Exeter.—Market, corn exchange and basement car park, Fore Street; H. B. Rowe, city architect, Municipal Offices.

Gateshead.—Meat processing factory, Saltmeadows Road, for Hay & Hindmarsh, Ltd.; Arthur & Kirkup, architects, 13, Swinburne Street.

Gillingham (Kent).—Works; Bowater Paper Corporation, Ltd., Bowater House, Knightsbridge, London, S.W.1.

Glasgow.—Bio-chemistry block for University; Keppie, Henderson & Partners, architects, 21, Woodside Place.

Grantham.—Bungalows (33), Earlesfield; borough surveyor.

Estate of 109 houses north of Dysart Road; H. C. Janes, Ltd., Aylesbury, Bucks.

Guildford.—Factory, Woodbridge Road, for A. Gray & Co., Ltd.; W. Deakin & Co., Ltd., Guildford Road, Woking.

Hertford.—Flats (20), West Street; Howes & Jackman, architects, 1, Verulam Buildings, Gray's Inn, London, W.C.1.

Loftus.—Shops and houses, Easington Park estate; U.D.C. architect, 41, Baxtergate, Whitby.

London.—Garage and underground car park, Finsbury Square; Shingler & Risdon, architects, 47, Bedford Row, W.C.1.

Flats (48), Granard Road, Wandsworth; C. E. Culpin, architect, 39, Doughty Street, W.C.1.

Luton.—Central library, Bridge Street; director of housing, Town Hall.

Maidenhead.—Secondary modern school, Furze Platt; county architect, Wilton House, Parkside Road, Reading.

Maidstone.—Departmental stores, Week Street/Brewer Street site; Prudential Assurance Co., Ltd., Holborn Bars, London, E.C.1.

Ten blocks of flats, Egerton Road and Dickens Road; borough engineer, Palace Avenue.

Middlesbrough.—Department of physical medicine, Middlesbrough General Hospital; P. H. Knighton, chief architect, Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne.

Newcastle-on-Tyne.—Factory, warehouse, etc., Portland Road, for British Paints, Ltd.; L. G. Mouche & Partners, architects, 24, Claremont Place.

New Mills.—Aged persons' bungalows (23), communal sitting room, laundry and warden's house; J. Bailey, clerk, Town Hall, New Mills, near Stockport.

Northern Ireland.—New medical block at Moyle Hospital for East Antrim Hospital Management Committee (£100,000); secretary, Moyle Hospital, Larne.

Old people's home at Omagh (£100,000); county surveyor, Omagh, Tyrone.

Houses (400) on clearance site; town clerk, Banbridge, Co. Down.

Secondary intermediate school, Florencecourt; city surveyor, Enniskillen, Fermanagh.

Northwich.—Home for the aged, Weaver Hall site, London Road; E. Taberner, county architect, County Hall, Chester.

Southampton.—Flats (136), in 5-storey blocks, Redbridge Triangle; borough engineer, Civic Centre.

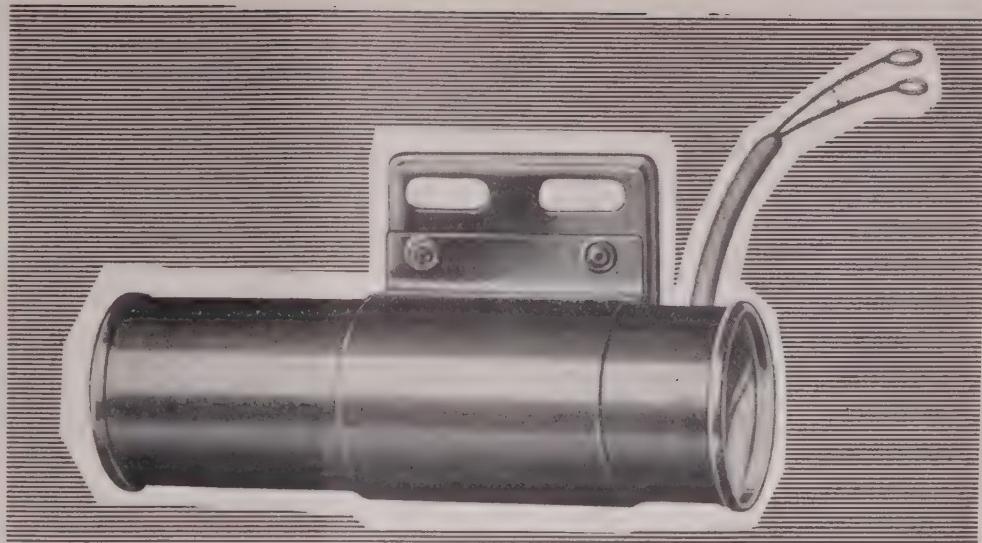
Stockton-on-Tees.—Church, Darlington Lane; J. S. Houghton, architect, 57, High Street.

Teddington.—Rebuilding of factory for Russell Bros., Ltd., Park Street; Fredk. Coyle & Co., Ltd., builders, High Street, Brentford.

Twickenham.—Showrooms and offices, Heath Road, for Chaucer Estates, Ltd.; Julian Keyes, architect, 13, Wimpole Street, London, W.1.

Watford.—Motor showrooms and offices, High Street; Rix & Rix, architects, High Street, Burnham, Bucks.

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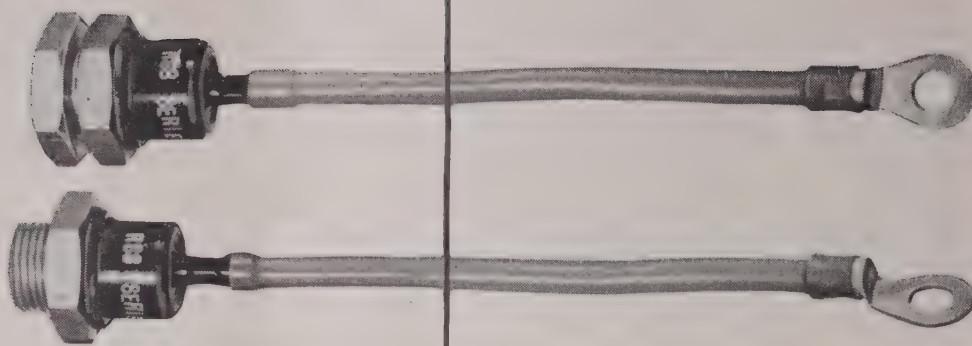
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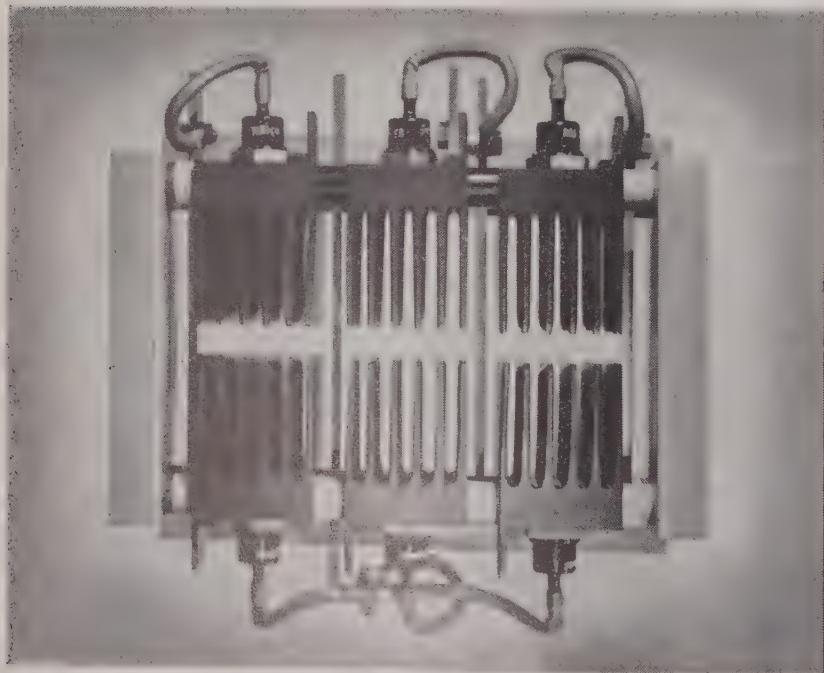
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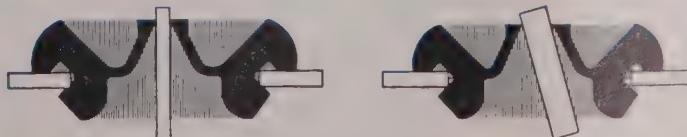
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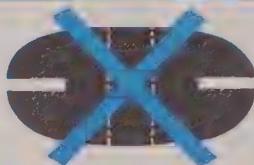
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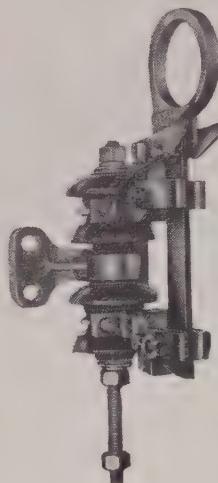
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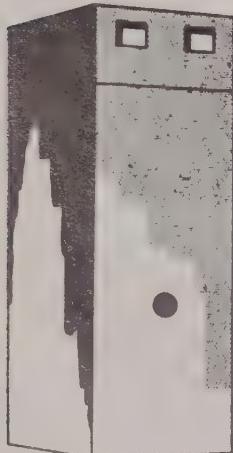
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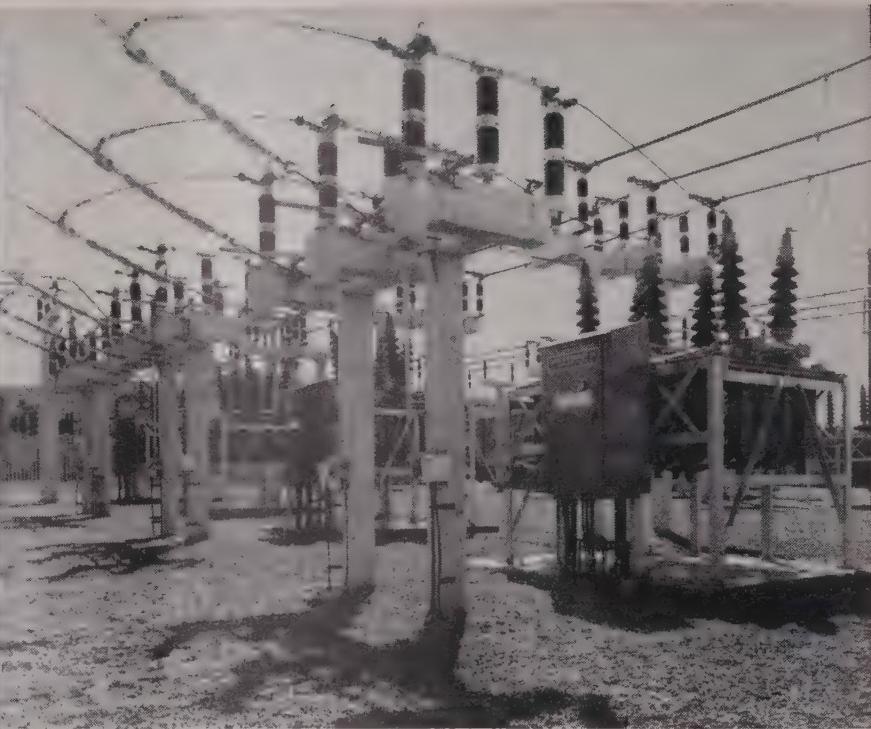
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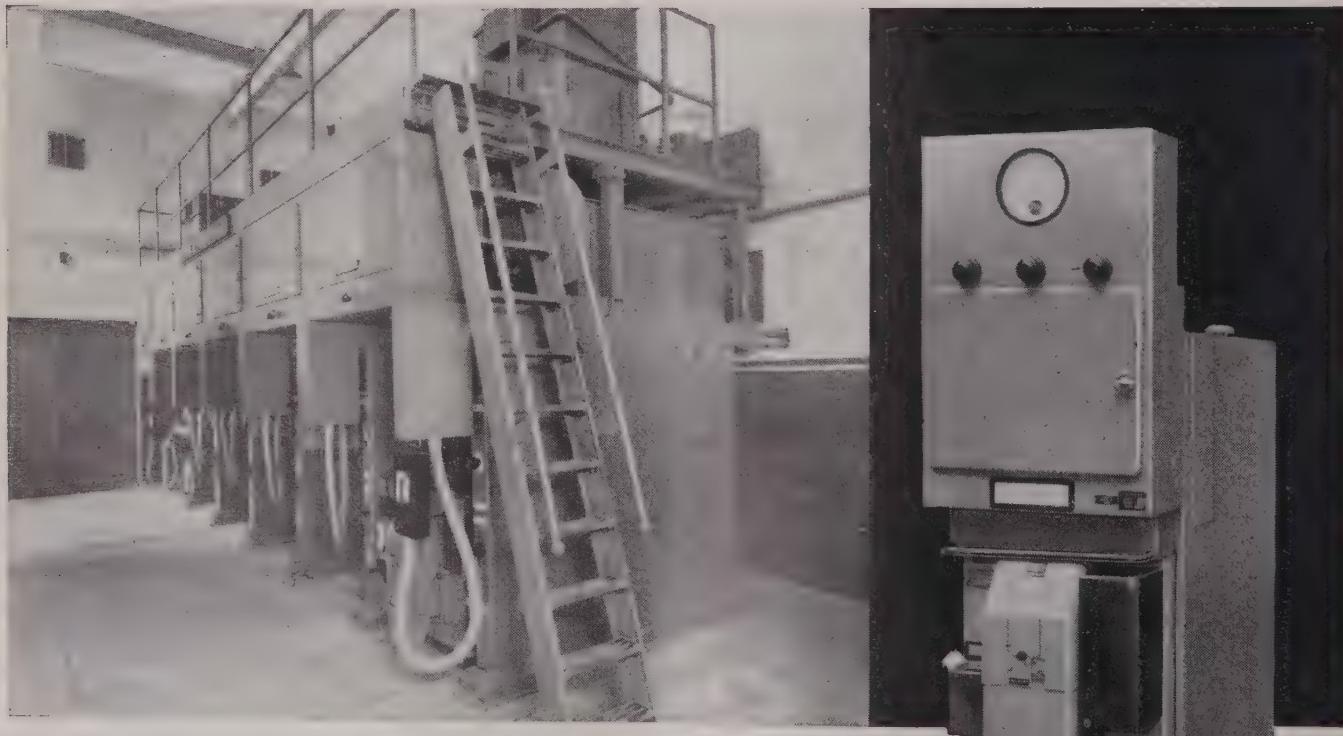
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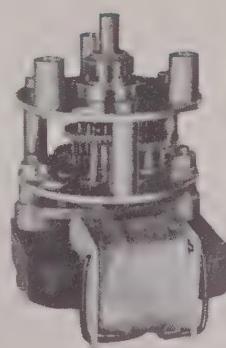
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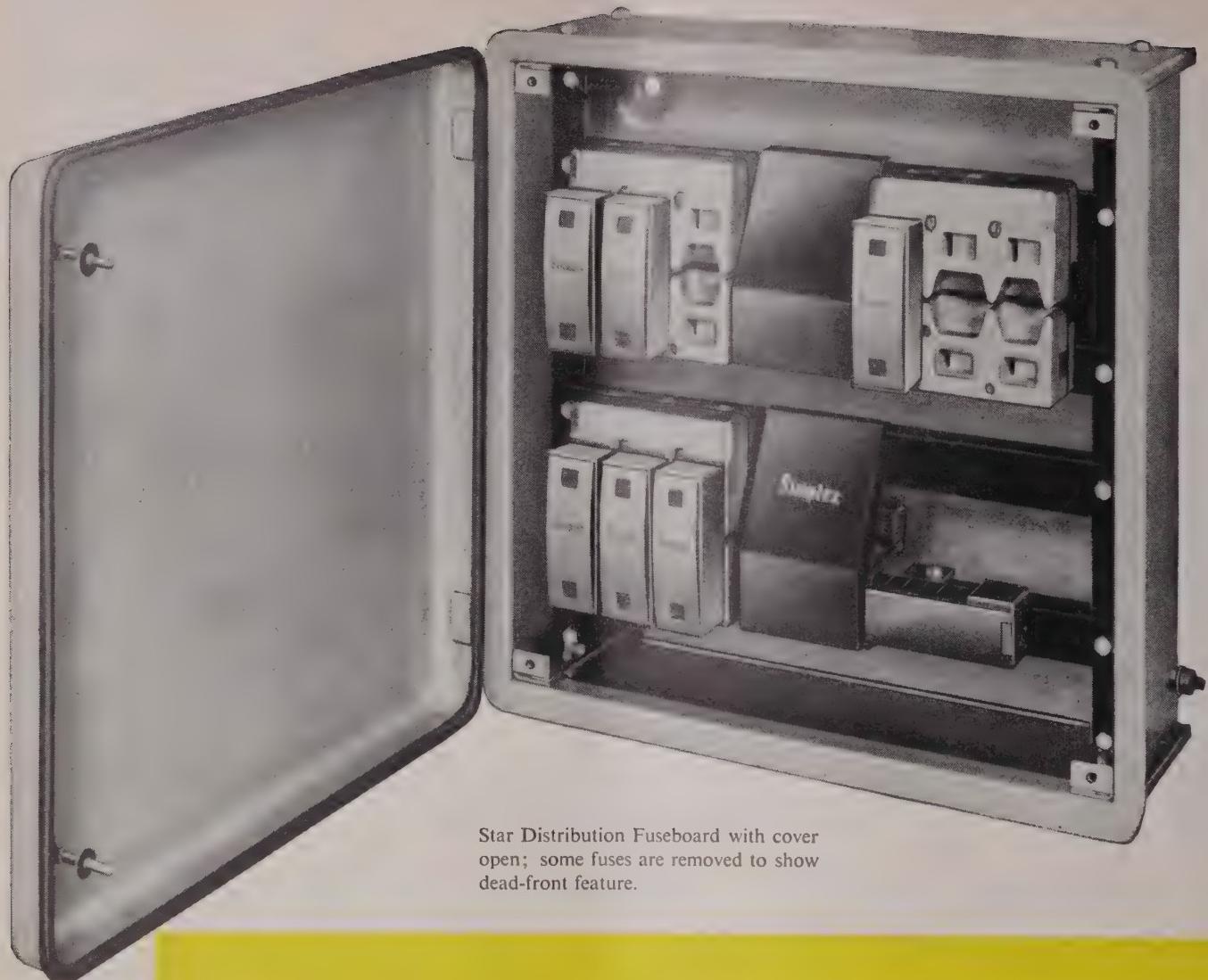
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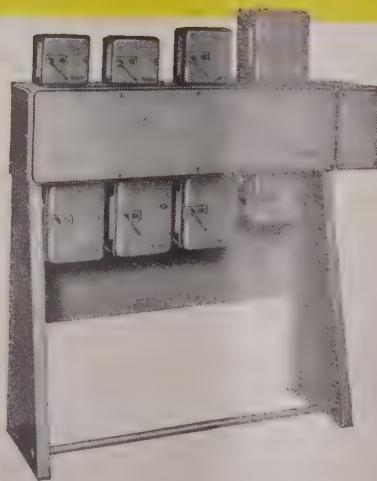
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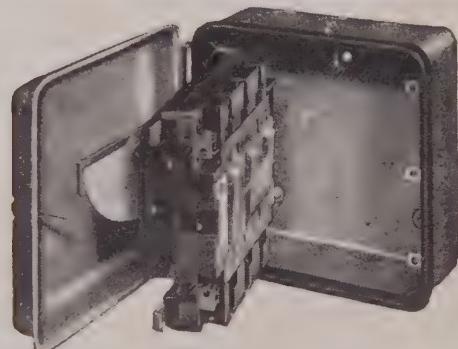


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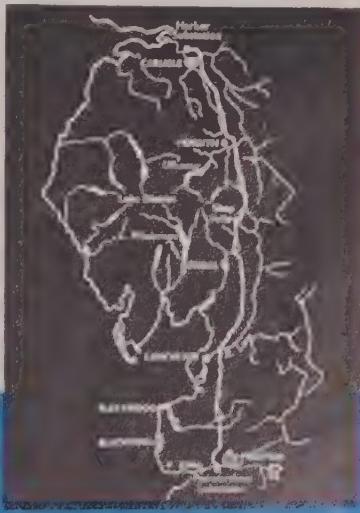
They built narrow-gauge railways to reach otherwise inaccessible sites, built special piled reinforced concrete foundations for towers sited on peat, erected 245 ft. high crossing towers to carry the line across the River Ribble, called in the coastguard to aid in conductor stringing by firing rocket lines over the River Lune and a protected wooded valley—in fact, used every trick in the book to push the construction work ahead.

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92-mile route of Line across three counties



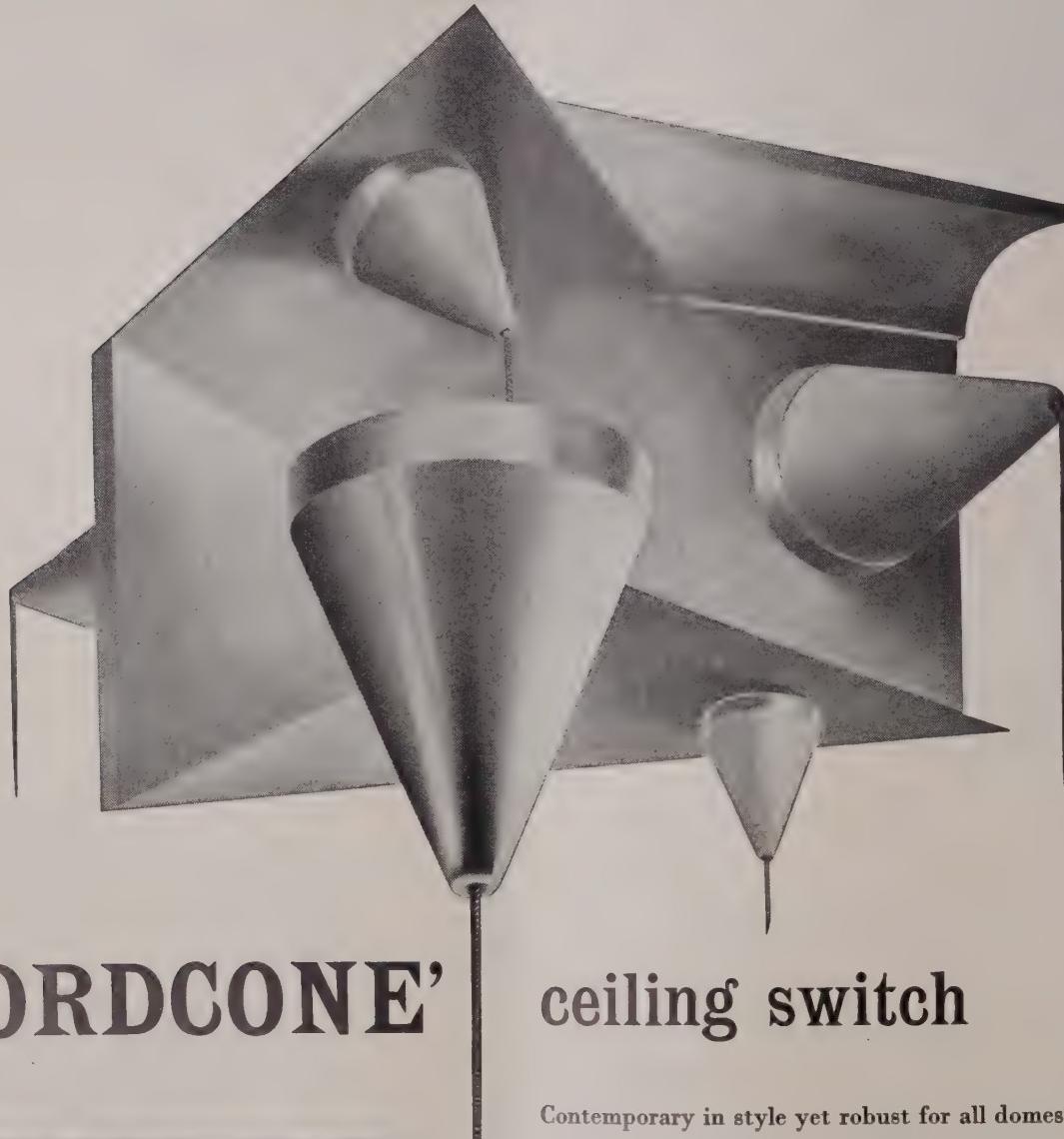
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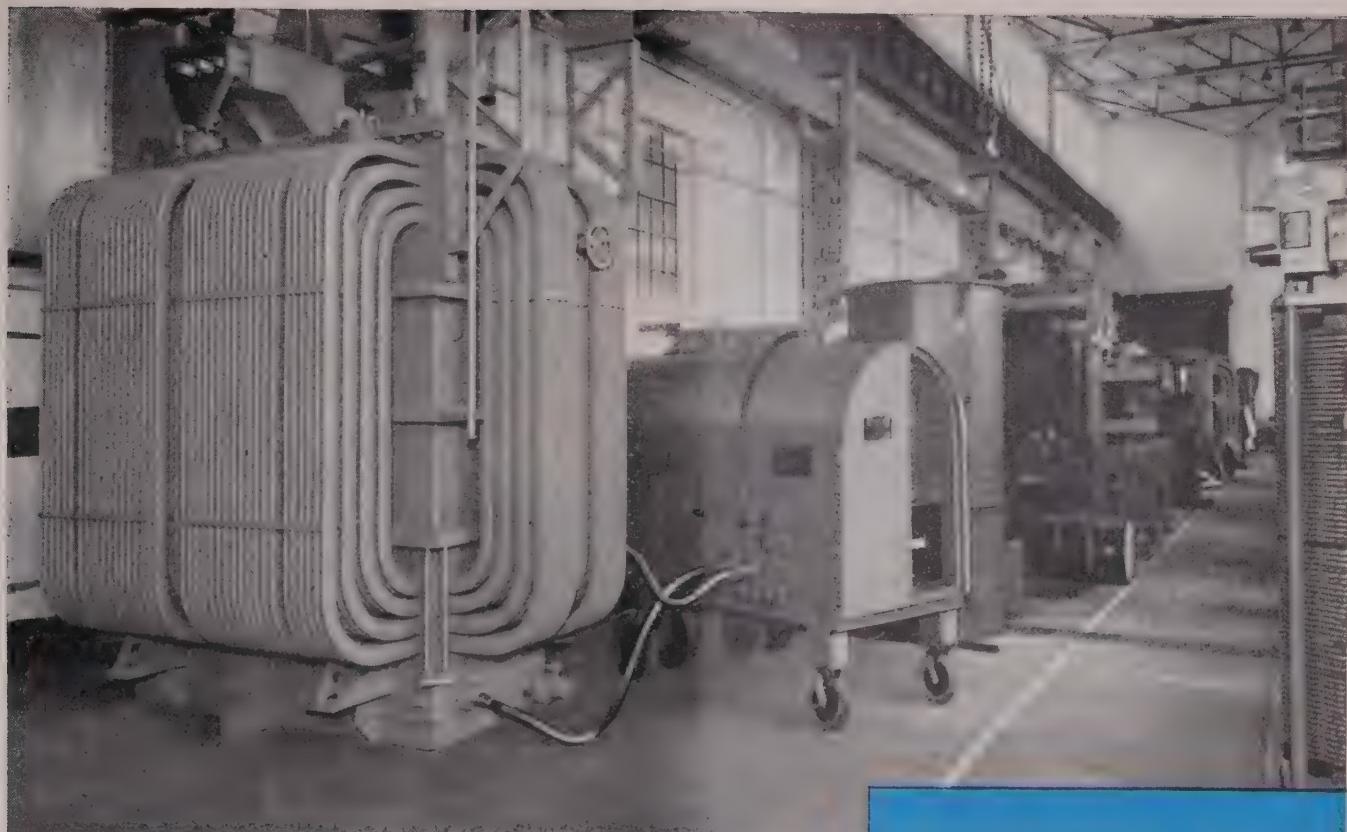
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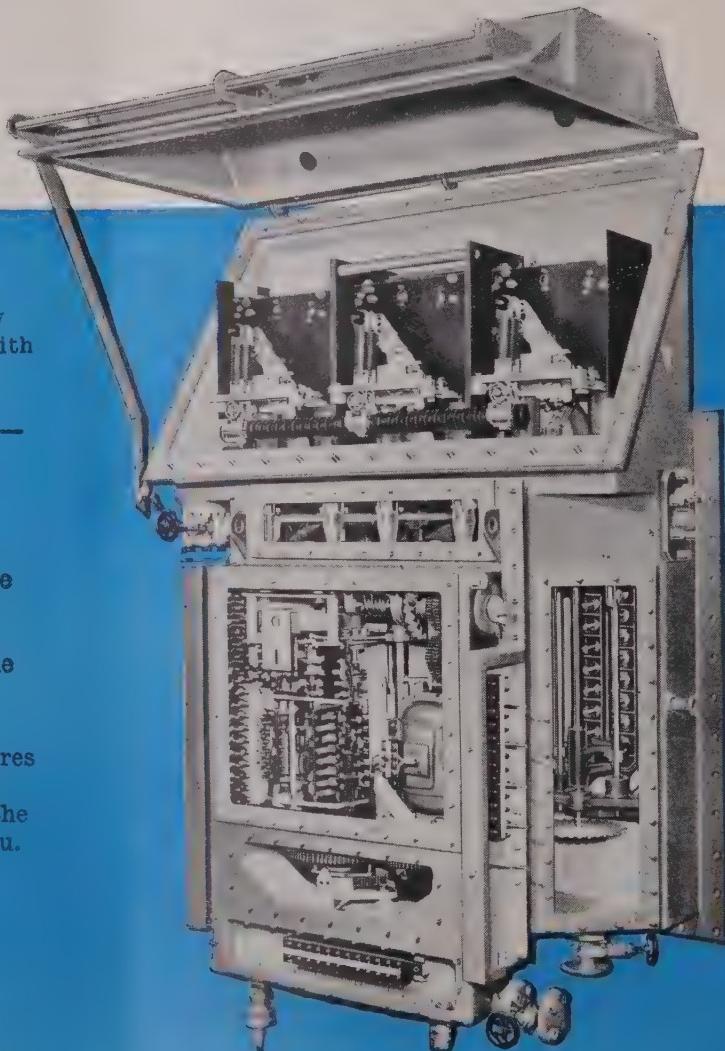
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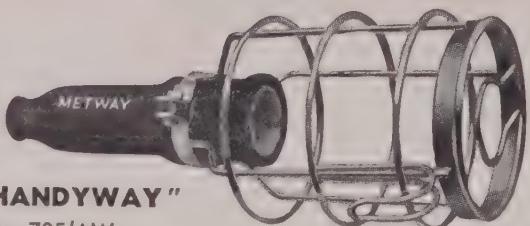
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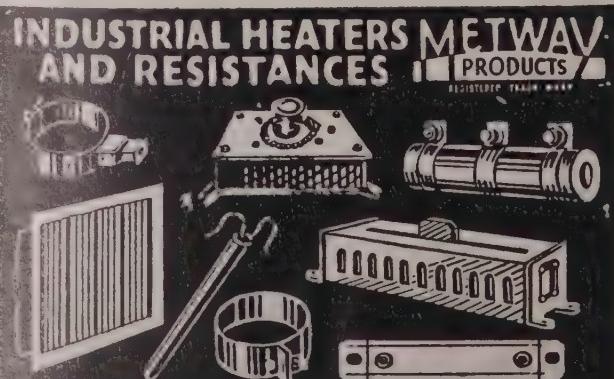
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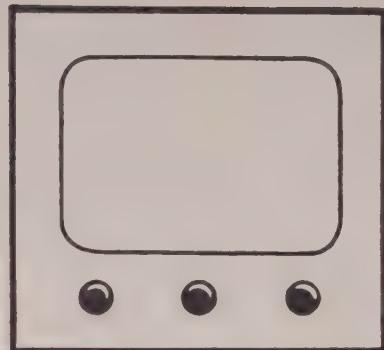
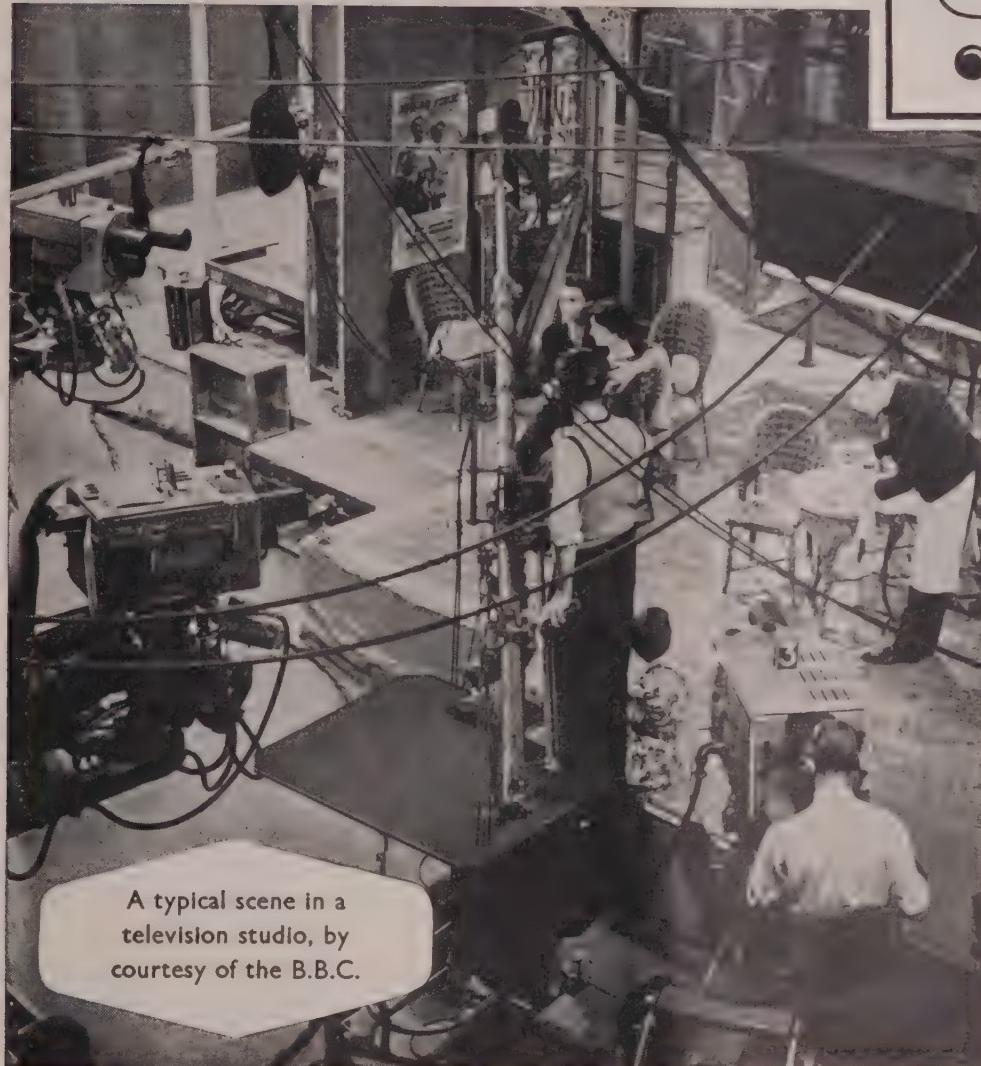
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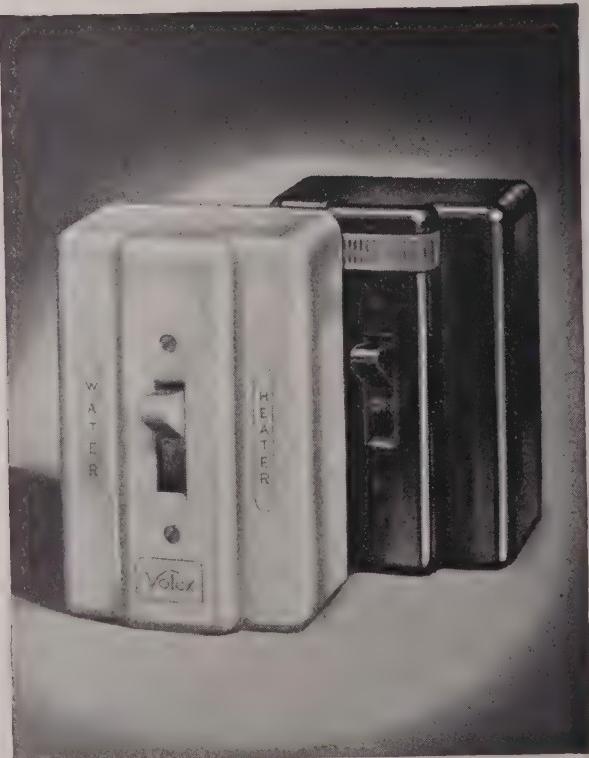
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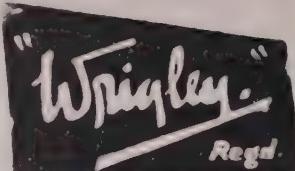
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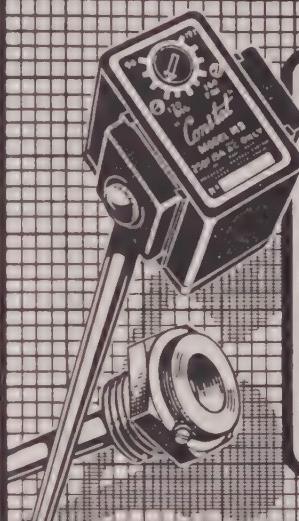
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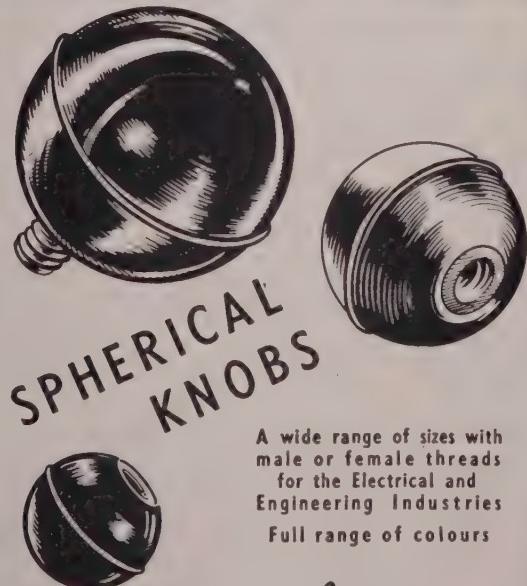
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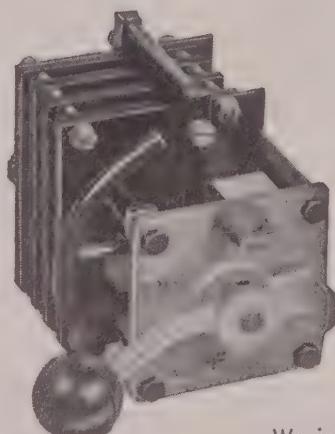
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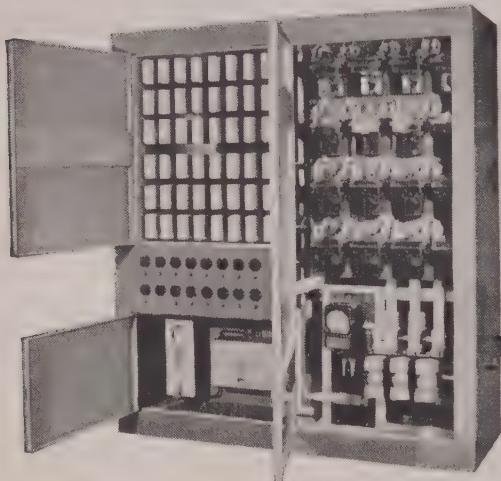
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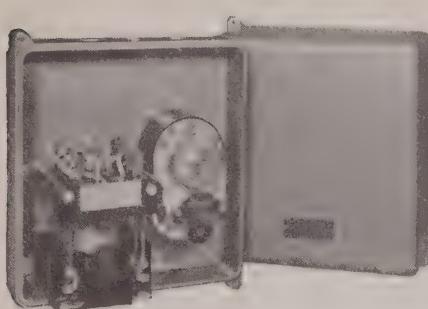


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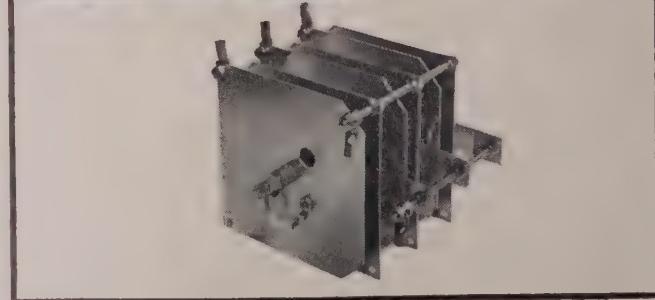
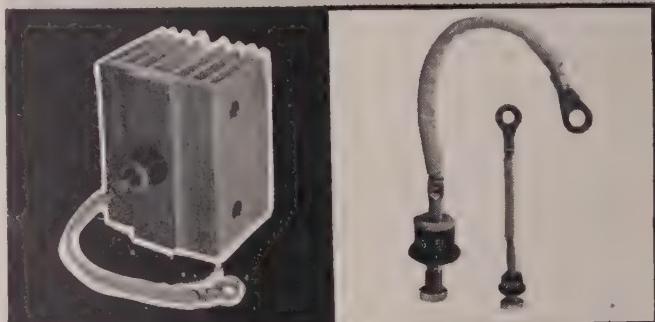
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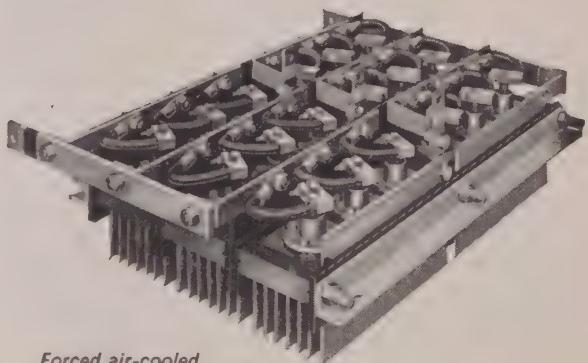
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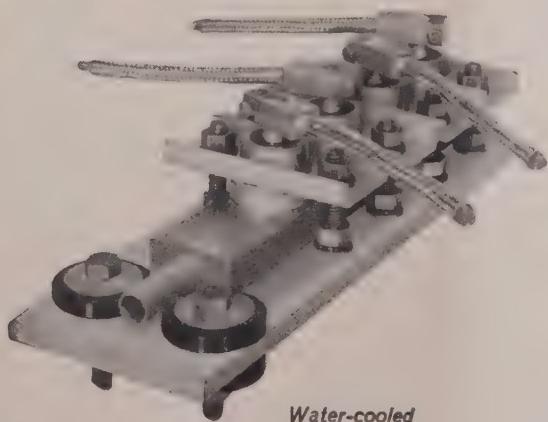
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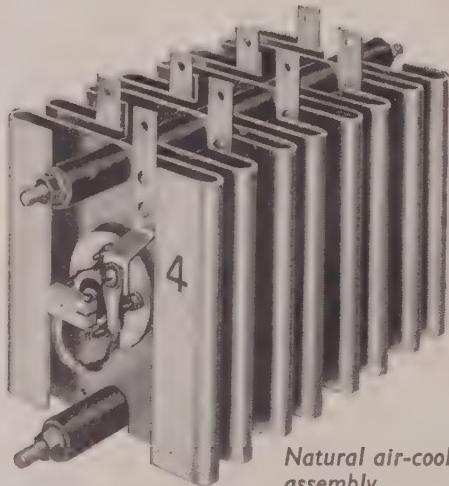
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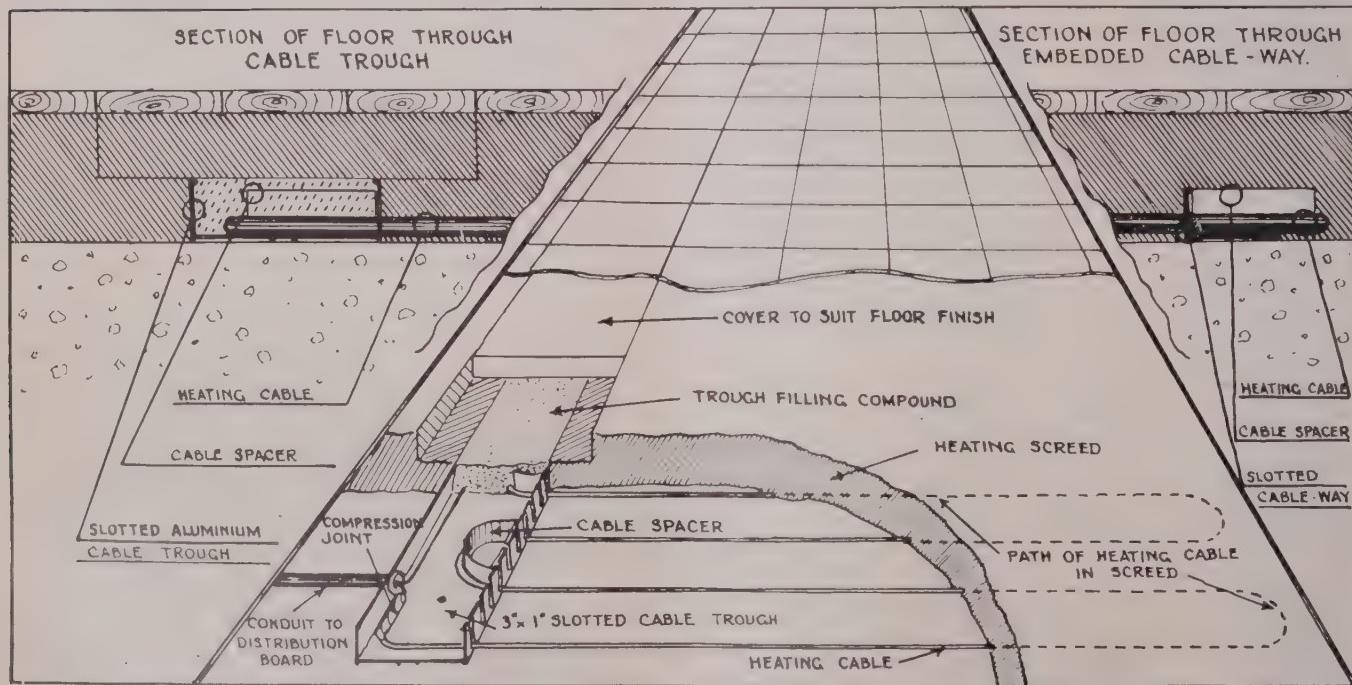


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MIDLANDS**WALKER BROS. (ELECTRICAL ENGINEERS) LTD.**
Quality House, Temple Row, Birmingham 2

Telephone: CEN. 7611/5

Electrical Installation Engineers. Industrial Installation Specialists
Established 1895**HARRIS & SHELDON LTD.**
31 Stafford Street, Birmingham 4

Telephone: Central 7101

For all electrical contracting installations, lighting, heating, power, public address, etc.

Electrical and Mechanical Engineers, Factors

THE BIRMINGHAM POWER TRANSMISSIONS LTD.
117/118 Snow Hill, Birmingham 4

Telephone: AST. 2086-9

... for all electrical installations

F. H. WHEELER & CO. LTD.
553 Moseley Road, Birmingham 12

Telephone: Calthorpe 2601-2

DYNAMO & MOTOR REPAIRS LTD.
Belgrave Terrace, Soho Road, Birmingham 21

Telephone: Northern 0898

Motor and generator repairs and rewinds. Installations and factory maintenance.
Electrical plant stockists

(Continued on page 97)

ELECTRICAL INSTALLATIONS LTD.

Faraday Works, Stoney Stanton Road, Coventry

Telephone 22970

Industrial Electrical Work of All Kinds. Over 40 Years' Experience

FRANCE'S ELECTRIC LTD.

Darlaston, Staffs.

Telephone: JAMES Bridge 2822/3/4

Electrical Engineers and Contractors

For all types of Electrical Installations

W. J. FURSE & CO. LIMITED

Traffic Street, Nottingham

Telephone: 83471 (5 lines)

Electrical Engineering Contracting Specialists

SOUTH WALES**CLARKE BROS. (Stroud) LTD.**

Green Park Street, Aberavon

Telephone: Port Talbot 2991

Electrical Engineers and Contractors

Rewinds and Repairs. Industrial Installations

DRAKE & GORHAM (Contractors) LTD.

13 St. Andrew's Crescent, Cardiff

Telephone: Cardiff 32080

Electrical Engineers and Contractors

... for all electrical installations

F. H. WHEELER & CO. LTD.

117 Woodville Road, Cardiff

Telegrams: " Whelect "

Telephone 21281-2

CLARKE BROS. (Stroud) LTD.

High Street, Merthyr Tydfil

Telephone: Merthyr Tydfil 3377

Electrical Engineers and Contractors

Rewinds and Repairs. Industrial Installations

MERSEYSIDE & N. WALES

Electrical Engineers and Contractors for over 50 years

TROUGHTON & YOUNG LTD.

46 Rodney Street, Liverpool 1

Telephone: Royal 9231

HIGGINS & CATTLE LTD.

322 India Buildings, Water Street, Liverpool 2

Telephone: Liverpool Central 1729

Electrical Engineers and Contractors

Electrical Engineers and Contractors since 1919

SPEEDS (Widnes) LIMITED

2-4-6 Appleton Village, Widnes, Lancs.

Telephone: Widnes 2471-2-3

YORKSHIRE

Electrical Engineers and Contractors

SOUTHERN & REDFERN LTD.

Woodhead Road, Bradford 7

Textile Maintenance, Repairs and Rewinds

Telephones: Bradford 23871—Late Phone: Bradford 65837

GREEN & SMITH LTD.

Albert Works, Meadow Lane, Leeds 11

Telephone 20834-5-6

Industrial and Commercial Installations. Motor Sales and Repairs.

Electrical Floor Heating and Air Conditioning, etc.

... for all electrical installations

F. H. WHEELER & CO. LTD.

44 Bank Street, Sheffield 1

Telegrams: " Whelect "

Telephone 24015 (3 lines)

NORTH WESTERN**STEWART THOMSON & SONS (Liverpool) LTD.**

Fort Road, Seaforth, Liverpool 21

Repairs and Rewinds A.C. and D.C. to 3,000 horsepower. Breakdowns,

Urgent Repairs, etc. 24-hour service

Telephone: Bootle 2697-8

DRAKE & GORHAM (Contractors) LTD.

21 Newton Street, Piccadilly, Manchester 1

Telephone: Manchester Central 4701

Electrical Engineers and Contractors

... for all electrical installations

F. H. WHEELER & CO. LTD.

Regal Buildings, Oxford Road, Manchester 1

Telephone: Central 8207-8

Industrial Installations

W. H. SMITH & CO. ELECTRICAL ENGINEERS LTD.

Contracting Manufacturing Shepley Estate, Audenshaw

12 York Street, Manchester 2 DENton 3961

Electronic Maintenance

Grosvenor Street, Manchester

ARDwick 5011

Industrial Installations

THE NELSON ENGINEERING CO. LTD.

Telephone: Nelson 62545

Electrical and Mechanical Engineers

Complete Industrial Installations. Rewinds

Netherfield Road, Nelson

(Continued on page 97)

(Continued from page 96)

Electrical Engineers and Contractors since 1919
SPEEDS (Widnes) LIMITED
 2-4-6 Appleton Village, Widnes, Lancs.
 Telephone: Widnes 2471-2-3

NORTH EASTERN**COX-WALKERS LTD.**

North Eastern Electric Works, Feethams, Darlington
 Electrical Contractors of repute since 1880. Motor Rewinds and Manufacturing
 Engineers
 Telephone: 66277/8

Engineers and Contractors

CITY ELECTRICAL CO.
 Turks Head Yard, Cecil Street, Lincoln
 Telephone: Lincoln 124 London: Holborn 9722

FAIRBAIRN & PARTNERS (Newcastle) LTD.
 60 Lovaine Place, Newcastle-upon-Tyne 1
 Telephone: Newcastle 2 1052

Electrical Engineers and Contractors

... for all electrical installations
F. H. WHEELER & CO. LTD.
 52 Elswick Road, Newcastle
 Telephone: Newcastle 36271

REPUBLIC OF IRELAND

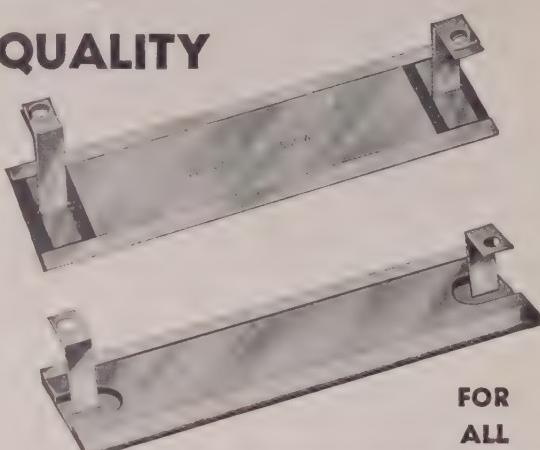
Electrical Engineering Contractors
A. G. BRUTY LIMITED
 38 Dawson Street, Dublin
 Telephone: Dublin 73181

Applications for particulars of costs and standard style
 of advertisements in this Regional Guide should be
 addressed to:

THE
 ADVERTISEMENT DEPARTMENT,
 ELECTRICAL REVIEW,
 DORSET HOUSE, STAMFORD STREET,
 LONDON, S.E.1

ELEMENTS

OF

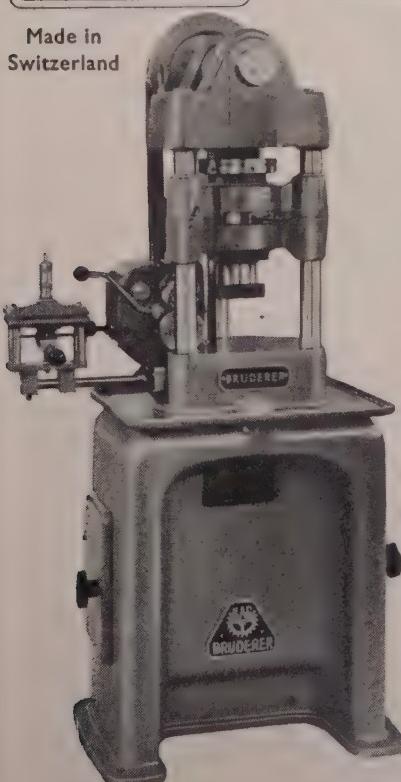
QUALITYFOR
ALL**WASHBOILERS****THE ELECTRIC ELEMENTS CO.**

Tokenhouse Yard

NOTTINGHAM

Makers of Elements since 1921

Stocked by Leading Wholesalers

Made in
Switzerland

up to 84,000 pressings hourly

**BRUDERER Precision Automatic
Punching Presses**

- ★ Available in capacities of 12 and 20 tons
- ★ Precision Strip Feed with accuracy of .0005" according to stroke
- ★ Feeding length infinitely variable to 6 $\frac{1}{4}$ "
- ★ Stroking Speeds infinitely variable or in steps up to 1400/1500 s.p.m.
- ★ Round Guideways lapped to ensure greatest accuracy and prolonged tool life

Reports show that 5 million pressings have been produced on BRUDERER Presses before regrinding tools

Birmingham
 Showroom:
 1075 Kingsbury Rd.,
 Birmingham 24

Telephone:
 Castle Bromwich
 3781

Exclusive Distributors in the United Kingdom

**the PRESS & SHEAR***Machinery Co. Ltd.*

172-174 VICTORIA ROAD · ACTON · LONDON W3

Telegrams: PRESACT LONDON TELEX

COLD METAL PRESSINGS MANUFACTURERS

1,000 amps.



Write for
prices and
illustrated
list.

COPPER TUBULAR CABLE SOCKETS

DIPPED TINNED

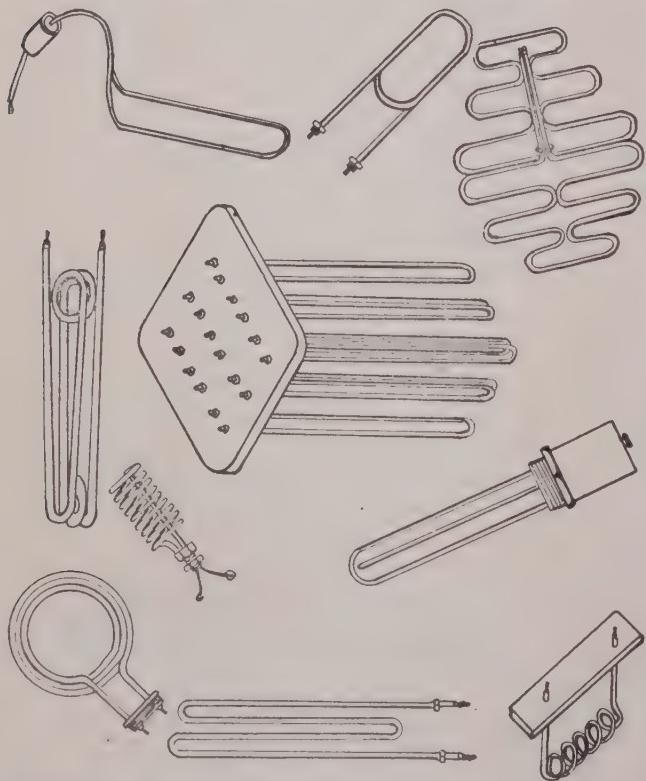
B.S.I. Type No. 91-1930
No. 91-1954

X.L. Light Type

EXCELL METAL WORKERS LTD.

Phone: Victoria 0297 BIRMINGHAM 11 Grams:
"Superpress"

ELTRON for ELEMENTS

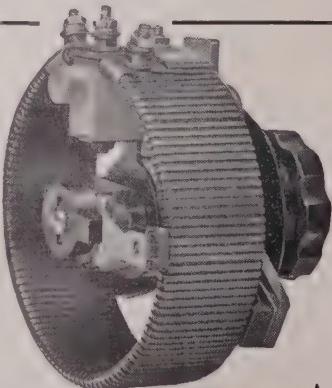


ELTRON (London) LTD., Strathmore Road, Croydon

Telephone: Thornton Heath 1861

a range of extremely robust

ROTARY RHEOSTATS



Open or enclosed types

100 watts

150 watts

200 watts

Larger sizes quoted on request

An extremely robust rheostat with a unique metal cored former (patent appd. for)

Full details from the manufacturers

The **CURTIS** Manufacturing Company Limited
26-28 PADDENSWICK ROAD HAMMERSMITH, W.6

Telephone: RIV. 4456 and 4583

QUICKEST, SAFEST, EASIEST TO USE FOR EVERY GAUGE WIRING



SCRUTIT

Trade Mark

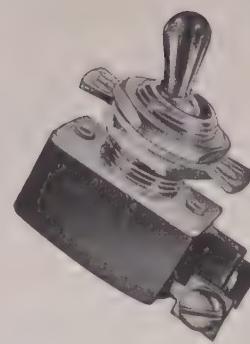
ONE PIECE PORCELAIN CONNECTORS BRITISH MADE
V.G. PORCELAIN CO. LTD. CONSTABLE DANE ROYAL, LONDON, N.W.10. Telephone ELGAR 7362

Distributors: S.O. Bowler Ltd., Gee (Birmingham) Ltd., Birmingham, and Metway Ltd., Brighton.

Arcologic

Switches

Neon Signal Lamps



G.600

S.L.160, S.L.162 and S.L.163

New miniature low cost Neon Signal Lamps.

$\frac{1}{2}$ " hole fixing. All completely waterproof.

The S.L.163 has small front of panel projection.

C.S.200: 15-AMP Rotary Cooker Switch.

Double pole three "heat" and "off."

S.L.50: Neon Signal Lamp with snap-in fixing.

M.30: 10-AMP Toggle Switch.

A.55: Refrigerator Door Switch.

S.254: A.C. only 10-amp Toggle Switch, double pole.

S.250: A single pole version of the S.254.

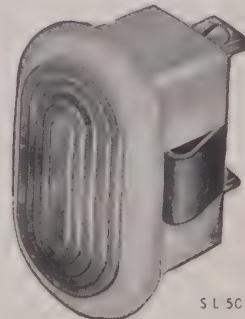
G.600: 3-AMP Toggle Switch.



S.L.160



S.L.162



S.L.50

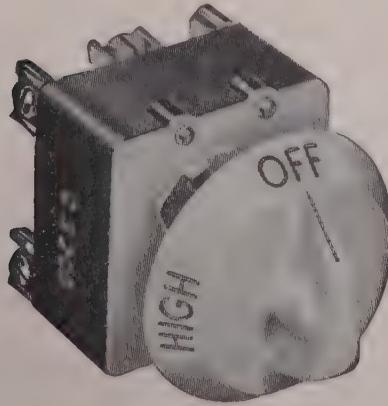


M.30

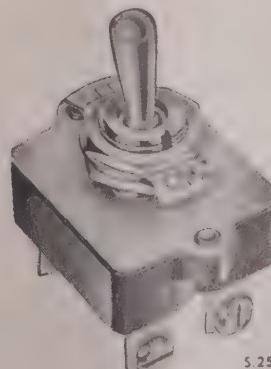
Write for Catalogue No. 132

Arcologic Switches Ltd.

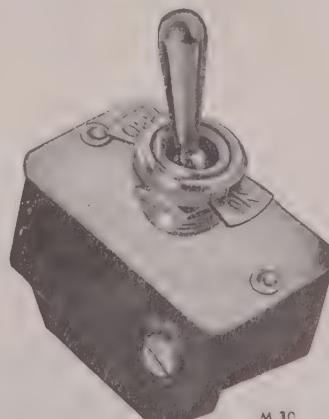
Central Avenue • West Molesey • Surrey • Tel. MOLESEY 4336



C.S.200



S.254

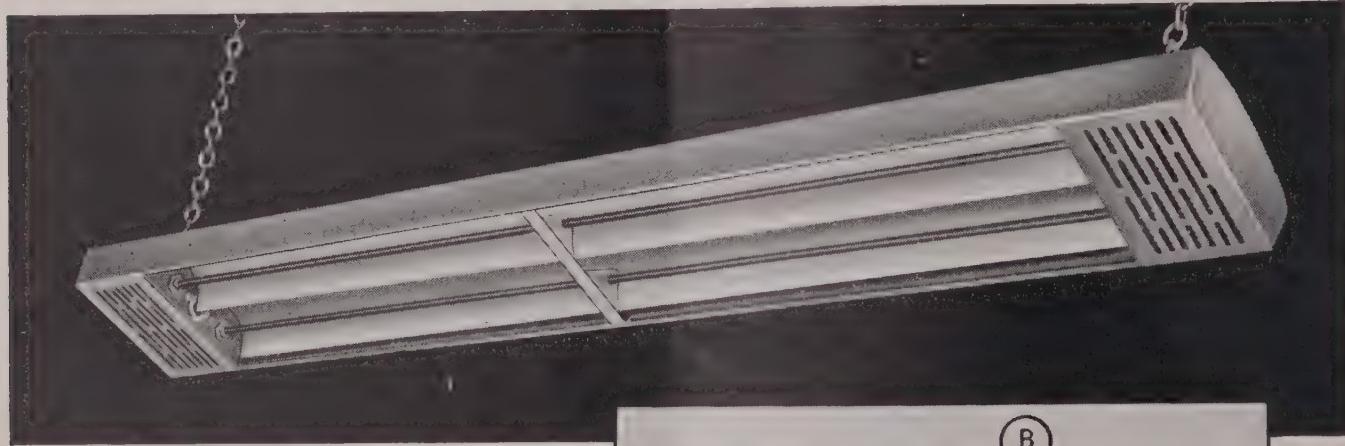


M.30

NEW!

TWIN - ZONE

overhead radiant heaters narrow beam or broad beam from one model



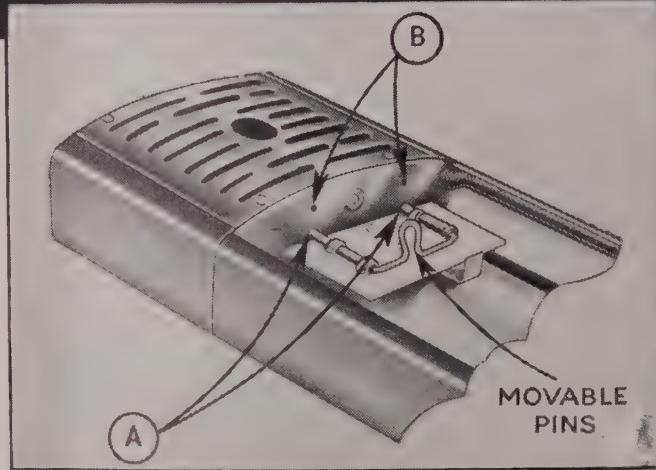
Of entirely new and unique design, these Twin-Zone overhead Radiant Heaters, in 1½ or 3 kW. loading, will give you more efficient and versatile heating than ever before. New high-density elements, completely safe in use, produce more heat per inch and the polished aluminium reflector radiates it with the maximum effect.

By a simple adjustment of the reflectors, Twin-Zone Radiant Heaters can be preset to give a concentrated or a widespread beam of warmth according to requirement.

Twin-Zone Radiant Heaters are ideal for use in commercial, industrial or public buildings and other premises where only intermittent heating is required or where poor thermal insulation makes overall air heating impracticable.

(Not available for domestic use).

- Versatility • Low Price
- High Efficiency • Attractive Slim Design
- Long Life 'Safety' Element



A Narrow beam position providing concentrated warmth over isolated sections of large buildings such as loading bays, hangers, machine shops and garages.

B Broad beam position giving a widespread zone of heat and can be used for complete heating installations in churches, village halls, community centres and similar buildings whether used intermittently or continuously.

1½kW — £7 . 10 . 0. (HO 6434)

3kW — £9 . 2 . 6. (HO 6435)



The G.E.C. specialises in industrial heating and manufactures every type of appliance. We shall be very pleased to give you free advice on any of your heating problems.

FOR SPACE HEATING

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words).

DISPLAYED CLASSIFIED—4/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—18, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

OFFICIAL NOTICES, TENDERS, ETC.

NORTHAMPTON COUNTY BOROUGH EDUCATION COMMITTEE

Northampton School for Girls:
Electrical Work

CONTRACTORS wishing to tender for Electrical Re-wiring and improvements to the main block of the School for Girls, St. George's Avenue, Northampton, should apply to the Borough Architect, Guildhall, Northampton, by not later than the 14th June, 1960, enclosing a crossed cheque for two guineas payable to "Northampton Corporation." Deposits will be refunded only upon receipt of a bona fide tender, not subsequently withdrawn, by the date and time indicated on the form of tender. The Education Committee do not bind themselves to accept the lowest or any tender or to pay any costs incurred by persons tendering.

H. A. SKERRETT,
Chief Education Officer.

Springfield,
Cliftonville, Northampton.

4831

ELECTRICITY CORPORATION OF NIGERIA

Invitation to Tender High-Voltage Switchboard

THE ELECTRICITY CORPORATION OF NIGERIA invites tenders for the supply c. and f. Port-Harcourt of:—

I 8-panel, 250-MVA Switchboard insulated for operation on an 11,000-volt system.

Tender documents giving further details of the contract may be obtained from the Resident Engineer, Electricity Corporation of Nigeria, Adelphi, John Adam Street, London, W.C.2.

Each tender must be enclosed in a sealed envelope marked "Confidential, Tender for Supply of High Voltage Switchboard, Port-Harcourt," and must be received at the Office of the Secretary, Electricity Corporation of Nigeria, 13, Broad Street, Private Mail Bag 2030, Lagos, Nigeria, West Africa, not later than noon on 2nd July, 1960. Tenders received in any other manner will not be considered.

The Electricity Corporation of Nigeria does not undertake to accept the lowest or any tender.

Further information concerning this contract may be obtained on application to the Resident Engineer.

GEORGE W. NICOL,
Acting Secretary to
the Corporation.

4798

CLASSIFIED ADVERTISEMENTS
ARE PREPAID

COUNTY BOROUGH OF HASTINGS

College of Further Education: First Instalment

ELECTRICAL Contractors desirous of tendering for the electrical installation at the above are invited to submit their names, together with a deposit of three guineas (returnable on receipt of a bona fide tender) to the Borough Engineer, No. 37, Wellington Square, Hastings, not later than 12 noon on Thursday, the 16th June, 1960.

Tender documents will be forwarded to applicants immediately they become available.

N. P. LESTER,
Hastings. Town Clerk.

4796

FEDERATION OF MALAYA

CAMERON HIGHLANDS SCHEME: CONTRACT No. 6

TENDERS are invited for the supply and erection of Transformers to be installed on behalf of the Central Electricity Board of the Federation of Malaya.

The contract now advertised will comprise seven power transformers in sizes ranging between 20 MVA and 30 MVA and one 8-MVA power transformer, all suitable for connection to a 132-kV system, together with two 33/433-kV grounding/auxiliary transformers.

Tenders are invited only from firms who are prepared to submit complete tenders.

A short précis of the extent of the work for which complete and comprehensive offers are invited may be had on application to Messrs. Preece, Cardew & Rider, 8, 10 & 12, Queen Anne's Gate, London, S.W.1.

Tender documents, which will be available from 4th July, 1960, and returnable by 2nd September, 1960, may be obtained from the same address on receipt of a payment by cheque for £15 in favour of Preece, Cardew & Rider. This payment will not be refunded.

At a later date offers will be invited for Cables and Lighting. Persons interested in such should NOT now apply, but await further advertisements.

The Central Electricity Board do not bind themselves to accept the lowest or any tender, nor will they be responsible for any costs incurred by tenderers in making their tender.

4797

DURHAM COUNTY COUNCIL

TENDERS invited:—

Stockton-on-Tees Hardwick Estate, New Health Centre: Electrical Installation. Application for further details to County Architect, South Street, Durham, not later than 15th June, 1960.

J. K. HOPE,
Clerk of the County Council.

Shire Hall,
Durham.

4820

Advertisements are accepted up to first post on Monday of the week of issue

If displayed with boxed rules, name or symbol block by Friday prior to week of issue

All communications to be addressed to: Classified Advertisement Department, ELECTRICAL REVIEW Dorset House, Stamford Street London, S.E.1

Original testimonials should not be sent with applications for employment

BOROUGH OF KETTERING

Street Lighting

TENDERS are invited for the provision of 81 400-watt and 59 250-watt Mercury Vapour Lighting units on Steel Columns in connection with street lighting improvements within the Borough.

Tenderers may quote for:—

- The supply only of Lanterns auxiliary gear and lamps.
- The supply of Columns with erection, wiring and fitting of electrical equipment supplied by another firm.
- The whole of the work.

General conditions of contract and plans may be inspected, and specifications, bills of quantities and forms of tender obtained from the Borough Engineer and Surveyor's Office, 3, Gold Street, Kettering, on payment of a deposit of £2 2s., which will be refunded on receipt of a bona fide tender and the return of all documents.

Tenders in plain sealed envelopes endorsed "Street Lighting" must be delivered to the undersigned not later than noon on Thursday, 30th June, 1960.

The Council do not bind themselves to accept the lowest or any tender.

D. DUNSFORD PRICE,
Council Offices,
Huxloe Place,
Kettering.

4733

SITUATIONS VACANT

See "Replies to Box Numbers" above)

SOUTH WALES ELECTRICITY BOARD

Fourth Assistant Engineer

APPICATIONS are invited for the position of Fourth Assistant Engineer (shift duties) in the Board's Control Centre at Manselton, Swansea.

The salary for the position will be in accordance with Schedule B, Class AX/DX, Grade 7 (£840/£1,040), plus shift enhancement, of the National Joint Board Agreement for the Electricity Supply Industry.

Duties will involve assisting the Control Engineer (Shift) in the operation of an extensive overhead and underground high-voltage network. Applicants should have experience in the operation of high-voltage switchgear, transformers and associated protective equipment, and be familiar with the working of the safety rules.

Applications stating age, present position, present salary, qualifications and experience should be addressed to the undersigned at St. Mellons, Cardiff, so as to arrive not later than Wednesday, the 22nd June, 1960.

Envelopes should be marked "Assistant Engineer (Shift), S.V.23/60."

Previous applicants need not re-apply.

R. G. WILLIAMS,
Secretary. 4818

Situations Vacant (continued)**NEWCASTLE REGIONAL HOSPITAL BOARD****Appointment of Engineering Staff**

APPLICATIONS are invited for the following new superannuated appointments on the staff of the Regional Engineer:—

ENGINEERING GENERAL GRADE (ELECTRICAL).

Salary scale £1,160 × £45 (2) × £50 (7) to £1,600 per annum.

Applicants should be Corporate Members of the Institution of Electrical Engineers and have a wide experience in design work, estimating and preparation of specifications to cover electrical distribution network, power, lighting, radio, call systems, telephones, etc.

The candidate would be required to be responsible for the control of a small design team for all aspects of electrical engineering services for large building projects. Knowledge of the taking off of engineering bills of quantities would be an advantage.

ENGINEERING GENERAL GRADE (MECHANICAL), Heating & Ventilating.

Salary scale for Corporate Members of the Institution of Mechanical Engineers: £1,160 × £45 (2) × £50 (7) to £1,600 per annum.

Salary scale for Corporate Members of the Institution of Heating and Ventilating Engineers: £910 × £35 (1) × £40 (2) × £45 (5) × £50 (3) to £1,400 per annum.

Applicants should be Corporate Members of one of the Institutions mentioned above, and would be primarily engaged on design of central heating and hot water systems, air conditioning equipment, etc., and including design of steam boiler plant, laundry installations, etc. Experience in estimating and the preparation of specifications essential.

The candidate would be required to be responsible for the control of a small design team for all aspects of mechanical engineering services for large building projects. Knowledge of the taking off of engineering bills of quantities would be an advantage.

ENGINEERING DRAUGHTSMAN I: HEATING AND VENTILATING.

Salary scale £1,030 × £35 (2) × £50 (3) to £1,250 per annum.

ENGINEERING DRAUGHTSMAN II: HEATING AND VENTILATING AND ELECTRICAL.

Salary scale £870 × £35 (4) to £1,010 per annum.

Applicants should have served a recognised apprenticeship having obtained the Higher National Certificate in Mechanical Engineering for Grade I post or the Ordinary National Certificate in Mechanical or Electrical Engineering for Grade II post.

Candidates should be expert draughtsmen with experience in design work and the preparation of working drawings including details of equipment, in their own particular field.

Previous experience in hospital engineering desirable but not essential.

Applications stating age, qualifications, experience and present and previous appointments, together with the names and addresses of three referees (two technical), should be forwarded to the Secretary to the Board, Benfield Road, Newcastle upon Tyne, 6, within 14 days.

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

requires a TECHNICIAN to assist in the provision of an estimating service for experimental equipment connected reactors.

Work consists of DETAILED ENGINEERING OF MANUFACTURING, ASSEMBLY AND ELECTRICAL INSTALLATION WORK. GLOBAL ESTIMATING OF SCHEMES, PROVIDING AND MAINTAINING COSTING RECORDS.

Applicants should have served a recognised apprenticeship or have had equivalent training. A National Curriculum in estimating experience for electrical instrumentation an advantage.

SALARY £925 (at age 30 or over) to £1,160 per annum.

Housing and pension schemes.

Send POSTCARD for details to Personnel Manager (1706/48), U.K.A.E.A., A.E.R.E., Harwell, Didcot, Berks.



ASSOCIATED ELECTRICAL INDUSTRIES LIMITED

EDITORIAL ASSISTANT

ASSOCIATED ELECTRICAL INDUSTRIES LTD. have a vacancy at Trafford Park for an Editorial Assistant. This appointment offers an opportunity to work in close contact with engineers and scientists concerned with the foremost electrical engineering projects in the world. Duties will include the editing and preparation of technical sales literature, instruction books, etc., and demand the ability to write clearly and concisely on an interesting variety of electrical engineering subjects. Technical background and editorial experience preferred, but consideration will be given to suitable applicants wishing to enter this field.

Write fully, please, to :—

The Publicity Manager
ASSOCIATED ELECTRICAL INDUSTRIES (MANCHESTER) LTD.
Trafford Park, Manchester, 17

4605

CENTRAL ELECTRICITY GENERATING BOARD**Northern Project Group**

APPLICATIONS are invited for the following vacancies at Project Group Headquarters, Agecroft, Manchester. The successful candidates will be members of project teams dealing with the construction of new power stations.

SECOND ASSISTANT ENGINEER (Electrical) (Vacancy 60/18/R).

Salary range £1,195 × £50 to £1,545 per annum. Applicants should have experience of H.T. and L.T. switchgear, cables and electric plant associated with modern power station construction.

THIRD ASSISTANT ENGINEER (Electrical) (Vacancy 60/22/R).

Salary range £1,090 × £30 to £1,300 per annum. To assist in duties at 60/18/R.

SECOND ASSISTANT ENGINEER (Mechanical) (Vacancy 60/21/R).

Salary range £1,195 × £50 to £1,545 per annum. Applicants should have experience in design of boiler plant, turbine and feed heating plant, H.P. & L.P. pipe work and other mechanical plant associated with modern power station construction.

THIRD ASSISTANT ENGINEER (Mechanical) (Vacancy 60/23/R).

Salary range £1,090 × £30 to £1,300 per annum. To assist in duties at 60/21/R.

Membership, or qualification leading to membership, of an appropriate professional institution is desirable.

Application forms, available from Administrative Officer, Central Electricity Generating Board, Northern Project Group, Agecroft Road, Pendlebury, Swinton, to be returned by 17th June, 1960.

Please quote appropriate vacancy number. Envelopes marked "Confidential, Vacancy."

4803

AREA SALES MANAGERS

APPLICATIONS are invited for the position of Area Sales Managers particularly for London and Home Counties.

Applicants should have had previous experience selling Electricity Meters to Area Boards and have contacts at all levels.

There is a contributory pension scheme and gratuity provided.

Applications, which will be treated with strict confidence, giving full details as to age, training,

R. F. Taylor, Smith Meters Limited, Rowan Road, Streatham Vale, London, S.W.16. The envelope to be endorsed "A.S.M."

4587

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the under-noted superannuable appointments:—

1. SENIOR ASSISTANT ENGINEER (Transmission/Construction), Chief Engineer's Department (Ref. E21/60).

Applicants should have had a sound engineering training and be Corporate Members of the Institution of Electrical Engineers. They should be experienced in the design and layout of 132-kV and 275-kV substations, preparation of specifications for substation plant, handling of large contracts and supervision of erection work on site. A general knowledge of modern systems of protection and supervisory control would be considered an advantage.

Salary N.J.B. Class AX/EX, Grade 2, £1,475/£1,740 per annum.

2. FOURTH ASSISTANT ENGINEER (Heating and Ventilating), Chief Commercial Officer's Department (Ref. C4/60).

Duties will comprise the design of space heating and ventilation schemes including hot water central heating using electrode boilers and similar equipment.

Candidates should have a sound technical training in heating and ventilation. Experience in the preparation of estimates, specifications and drawings for central heating plants is required. Qualifications leading to membership of the Institution of Heating and Ventilating Engineers are desirable.

Salary N.J.B. Class AX/EX, Grade 7, £840/£1,065 per annum.

Applications, on the standard form and quoting appropriate reference number, should be submitted to the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 27th June, 1960.

4824

CENTRAL ELECTRICITY GENERATING BOARD**Midlands Division**

ASSISTANT SHIFT CHARGE ENGINEER is required at Ocker Hill Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G.9, £860-£905 per annum, plus 10% for shift duties.

A sound technical training and practical power station experience are required. Appropriate technical qualifications desirable.

Apply, quoting Vacancy No. 133/60MD, on forms AE6, which are available from the Station Superintendent, Ocker Hill Power Station, Bayleys Lane, Ocker Hill, Tipton, Staffs, to be completed and returned not later than 20th June, 1960.

4804

NO FUTURE IN YOUR PRESENT POSITION?

An open letter to
ENGINEERS, TECHNICIANS & DRAUGHTSMEN

YOU have probably seen our recent advertisements recruiting men of your profession to join our Research, Development and Production teams. We have begun an expansion programme covering the new and interesting applications of control equipment which current technological advances demand.

WE still require applicants for the following pensionable positions carrying good salaries, excellent prospects and the security of working with a world renowned organisation.

CONTROL GEAR ENGINEERS

Engineers and Technicians who are already engaged in the maintenance or application of electrical control gear for use in heavy industries. Qualifications: H.N.C. or practical equivalent.

CIRCUIT ENGINEERS

We require adaptable and imaginative men with electrical training to O.N.C. standard (or its practical equivalent). Experience of our equipment would be an advantage but we are prepared to train suitable applicants.

LIFT CIRCUIT ENGINEERS

Engineers with practical experience in the Lift industry. O.N.C. or equivalent qualifications.

In addition we have attractive positions to offer the following:

DESIGN DRAUGHTSMEN, DETAIL DRAUGHTSMEN, ENGINEERING ESTIMATORS, JUNIOR STANDARDS ENGINEERS, TRAINEE CONTRACTS ENGINEER

(O.N.C. or equivalent).

If you are in a dead end job — or even if you aren't, give me a ring or drop me a line to fix an appointment.
I look forward to meeting you

D. C. BRIDLE, PERSONNEL OFFICER

DEWHURST & Partner Limited
INVERNESS ROAD, HOUNSLAW
Tel.: HOU 7791

239

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

Central Gloucestershire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER (Cheltenham).

Experience necessary in the construction, operation and maintenance of large H.V. and M.V. underground and overhead distribution systems. Technical qualifications desirable. Salary £815/£860 per annum (N.J.B. Grade F.9).

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER (Dean Forest).

Applicants should have had wide practical experience in the sale and installation of domestic and commercial electrical equipment and the work associated therewith. The successful applicant will be required to assist in all branches of commercial work, including advising consumers on domestic, commercial and industrial equipment, estimating, contracting work and public lighting. Technical qualifications desirable. Salary £710/£755 per annum (N.J.B. Grade E.10).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

Wolverhampton and District Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER (Wolverhampton).

Duties will include the construction, maintenance and operation of H.V. and L.V. underground mains, overhead lines and substations and the planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary £965/£1,025 per annum (N.J.B. Grade J.9).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

F. W. CATER,
Secretary. 4815

TRINITY HOUSE, LONDON

APPLICATIONS are invited for appointment to the following posts in the Research and Development Section of the Corporation of Trinity House, London:—

(a) SENIOR EXPERIMENTAL OFFICER required to lead a development team concerned with the application of electronic and semiconductor techniques to new forms of navigational aids. Development experience in a similar field is essential and a knowledge of optics and acoustics would be an advantage.

Salary scale £1,395 by various annual increments to £1,660 per annum.

(b) TWO EXPERIMENTAL OFFICERS required for work on a wide range of projects embracing control, instrumentation and the application of semi-conductors to switching and fog signal generation.

Salary scale £1,005 by various annual increments to £1,233 per annum.

Qualifications required:—

For post (a) Corporate Membership of the Institution of Electrical Engineers or a Degree in Electrical Engineering is essential.

For posts (b) Pass Degree, H.N.C., C. and G. Final in Telecommunications or equivalent.

All candidates must be medically fit and of British nationality.

Applications should be made in writing to the Secretary, Trinity House, London, E.C.3, not later than 20th June, 1960, stating age, occupation, qualifications, and enclosing copies of recent testimonials.

4785

TRANSFORMER DESIGNER

for transformers and L.F. chokes

(a) Laminated and 'C' Core pattern up to 5 kVA.

(b) Power transformers up to 500 kVA.

Salary according to age and experience. 5-day week. Contributory pension scheme.

Apply:

WILLESDEN TRANSFORMER COMPANY LTD.
Manor Park Road, London N.W.10

(Elgar 5445)

309

NORTH WESTERN GAS BOARD

Manchester Group

Group Electrical Engineer

APPLICATIONS are invited for the above pensionable appointment at a salary within Group B of the Senior Officers' Salary Scales (£1,195/£1,355 per annum).

Applicants should be Corporate Members of the Institution of Electrical Engineers or hold qualifications leading thereto. They should have experience in the operation and maintenance of 2,500-kw, 6.6-kV alternators, H.T. and L.T. distribution systems, electric motors and starters up to 500 h.p. at 6.6 kV, and the organisation of routine electrical maintenance of gasworks plant. The total electrical load in the Group is of the order of 3,500 kW.

Applications, giving the names of two referees and quoting Vacancy No. 338, are to reach the General Manager, North Western Gas Board, Manchester Group, Town Hall, Manchester, 2, within 14 days.

4778

SENIOR ELECTRICAL SUPERINTENDENT

required by GAMBIA GOVERNMENT on contract for two tours of 18/24 months each in first instance. Salary, according to age and experience up to maximum, in scale (including inducement pay) £1,152, rising to £1,410 a year. Gratuity at rate 25% total salary drawn. Outfit allowance £60. Children's allowances up to £192 a year. Free passages. Liberal leave on full salary.

Candidates, preferably under 35 years of age, should possess H.N.C. in Electrical Engineering or equivalent, and must have had considerable experience of construction, maintenance and operation of plant, 400-v. and 1,100-v. lines and installation of domestic and industrial wiring systems. They should also be capable of design and estimate for installations. Knowledge of large diesel engine plants and refrigeration equipment an advantage.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, qualifications and experience, and quote M2A/51015/EF.

4772

Situations Vacant (continued)**MIDDLESEX COUNTY COUNCIL
EDUCATION COMMITTEE**

**Enfield Technical College,
Queensway, Enfield, Middlesex**

REQUIRED for 1st September, 1960, or as early thereafter as possible:—

LECTURER IN ELECTRICAL ENGINEERING to teach Electronics and Radio Communication to the standard of the Higher National Diploma and I.E.E. Part III Examinations. Candidates should be University Graduates in Electrical Engineering and preferably be Corporate Members of the Institution of Electrical Engineers. They should have had good industrial experience.

LECTURER IN MECHANICAL ENGINEERING to teach Mechanical Engineering subjects up to Higher National Diploma standard. Candidates must have a University Degree in Engineering and should preferably be Corporate Members of the Institution of Mechanical Engineers. They should have had industrial and teaching or research experience.

Salary within the range £1,408-£1,601 per annum.

Application forms (foolscap s.a.e.) from the Principal, to whom completed forms should be returned within 14 days of the appearance of this advertisement.

**C. E. GURR, M.Sc., Ph.D.
Secretary to the
Education Committee.**

4823

**ELECTRICITY CORPORATION
OF NIGERIA****London Office****Vacancy for Assistant Resident Engineer**

APPLICATIONS are invited from A suitably qualified Nigerians now resident in the United Kingdom, France or Germany for appointment as ASSISTANT RESIDENT ENGINEER in the London Office of the Electricity Corporation of Nigeria.

QUALIFICATIONS: A Degree in Electrical or Mechanical Engineering from a recognised university or its equivalent.

EXPERIENCE: Candidates should have at least two years' practical experience.

SALARY SCALE: Corporation Salary Scale 12. Basic salary £945 x £45 to £1,125 x £54 to £1,449 per annum, plus 11½% interim award. Overseas allowance £740 per annum married; £470 per annum single.

The basic salary scale is under review at the moment. The point of entry will be determined according to the successful candidate's qualifications and experience.

DUTIES: The successful applicant will on appointment be required to travel to assist the Resident Engineer.

- (a) Inviting and the purchase, and negotiations on the
- (b) Placing and pro
- (c) Liaison with on major projects.

CONDITIONS OF APPOINTMENT: The appointment will be on contract terms. The successful candidate should be prepared to accept the appointment and will be permanently based in London.

METHOD OF APPLICATION: Application forms, which can be obtained from the Resident Engineer, 1 Bedford Square, London, W.C.1, should on completion be returned to him c/o Electricity Corporation of Nigeria, Adelphi (4th Floor), John Adam Street, London, W.C.2, not later than the 31st July, 1960.

4802

**ATOMIC ENERGY RESEARCH
ESTABLISHMENT, HARWELL**

has vacancies for

ELECTRICAL TECHNICIANS

POST A: To be responsible to a Senior Officer for the day-to-day ELECTRONIC, ELECTRICAL and INSTRUMENTATION MAINTENANCE of reactor equipment in a high-flux reactor.

SALARY: £1,105 - £1,340 p.a.

POST B: To be in charge of the MAINTENANCE of a medium-flux reactor.

SALARY: £925 (at age 30) to £1,105 p.a.

Applicants should have served a recognised engineering apprenticeship or have had equivalent training which for POST A should have been in the electrical engineering field.

An appropriate National Certificate or equivalent an advantage for POST B and desirable for POST A.

EXPERIENCE REQUIRED:

For POST A, experience of instrumentation and light current electrical equipment.

For POST B, experience of maintenance of electronic, light electrical and electro-mechanical equipment is desirable.

Housing and contributory pension schemes.

Send POSTCARD for details to Personnel Manager (1688/48), U.K.A.E.A., A.E.R.E., Harwell, Didcot, Berks.

4770

**CENTRAL ELECTRICITY
GENERATING BOARD****London Division**

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for post (a) and Corporate Membership for post (b) an advantage.

(b) **THIRD ASSISTANT ENGINEER,**
ELECTRICAL DEPARTMENT,
DIVISIONAL HEADQUARTERS,
GENERATION HOUSE
(Vacancy No. 60/400).

Applicants should preferably be Corporate or Graduate Members of the Institution of Electrical Engineers or possess other equivalent qualifications, and should have experience in the design, layout and installation of substation plant, including the preparation of schemes, specifications and estimates, together with a knowledge of site testing and commissioning of substation plant. Salary Class AX/EX, Grade 6 = £975-£1,220 per annum.

(a) **ASSISTANT ENGINEER (Statistics),**
DEPTFORD WEST
POWER STATION
(Vacancy No. 60/402).

Applicants, who may be either male or female, should have had good technical training, and with ability to compile and present statistical data relating to power station operating efficiency. Salary Class J, Grade 14 = £750 per annum.

Applications, quoting vacancy number, to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 20th June, 1960.

4802

**MERSEYSIDE AND NORTH WALES
ELECTRICITY BOARD**

ASSISTANT SECTION ENGINEER required at Oswestry. Salary within range £860 per annum (N.J.B. F/9).

Applicants should preferably have had experience in the construction, operation and maintenance of overhead and underground high voltage networks, with their associated sub stations and equipment.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhosyddien, nr. Wrexham. Closing date 20th June, 1960.

4822

MINISTRY OF AVIATION

ELectrical Engineers (Assistant Signals Officers) required for aviation telecommunications and electronic navigational aids. Minimum age 23; 1st or 2nd Class Degree in Physics or Engineering, or A.M.I.E.E. or A.F.R.A.E.S. (candidates with Parts I, II and III of A.M.I.E.E. or Parts I and II of A.F.R.A.E.S. or equivalent, or of very high professional attainment without these qualifications considered).

Salary £690 (age 23) to £1,125 (age 34), maximum £1,300. Slightly lower outside London and for women.

Further details and forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.161/OA.

267

**SENIOR PRODUCTION
ENGINEERS**

are required by

W. H. ALLEN SONS & CO. LTD.

DUE to expansion, vacancies exist for additional Senior Production Engineers capable of originating and developing improved manufacturing techniques over a wide range of products on a one-off and small batch basis.

Applicants must have experience in the manufacture of one or more of the following:—

STEAM TURBINES.
DIESEL ENGINES.
ELECTRICAL MACHINERY.

These appointments carry high responsibility and offer good prospects for further advancement. The company offers good conditions of service, a contributory pension and life assurance scheme, and a comprehensive range of welfare and recreational amenities. Assistance towards the expenses involved in moving to the Bedford area will be given to successful applicants where applicable. Salary will be according to qualifications and experience.

Applications, which will be treated in the strictest confidence, should be made in writing, quoting the reference number, to:—

THE PERSONNEL MANAGER
(Ref. 1604E/20)
QUEENS ENGINEERING WORKS
BEDFORD

4775



have a vacancy for an

ELECTRICAL ENGINEER FOR GERMAN-ENGLISH TRANSLATIONS

APPLICATIONS are invited from British-trained engineers with a good general education and sound technical training, preferably also with practical experience in the application of electric equipment. Good working knowledge of German is essential. The ability to write clearly and concisely will be expected of candidates.

A five-day week is worked, with generous holidays. Favourable housing conditions for permanent staff.

Apply, stating age, education, qualifications, experience and salary required to:—

SIEMENS - SCHUCKERTWERKE AKTIENGESELLSCHAFT

Personalabteilung, Erlangen, Werner-von-Siemens-Strasse 50
Germany

245

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

AYLESBURY DISTRICT

- (i) TWO THIRD ASSISTANT ENGINEERS (138/60.N).
- (ii) TWO FOURTH ASSISTANT ENGINEERS (139/60.N).

Candidates for these positions should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems, including substations.

Salary N.J.B. Class F: (i) Grade 9 (£815-£860); (ii) Grade 11 (£710-£755).

Apply by letter to the Manager, Aylesbury District, Eastern Electricity Board, Exchange Street, Aylesbury, Bucks, by 24th June, 1960.

Essex Sub-Area

CHELMSFORD DISTRICT

THIRD ASSISTANT ENGINEER (140/60.R). Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground systems including substations.

Salary N.J.B. Class F, Grade 9 (£815-£860).

Apply letter to D. H. Walker, A.M.I.E.E., Manager, Chelmsford District, Eastern Electricity Board, Anchor Street, Chelmsford, Essex, by 24th June, 1960.

Suffolk Sub-Area

SUB-AREA HEADQUARTERS

SUB-AREA ENGINEER (141/60.R). Candidates should be Corporate Members of the Institution of Electrical Engineers and should have had wide experience in the planning, operation, maintenance and construction of large distribution systems in both urban and rural areas.

The post involves responsibility for extensive capital and revenue works and the control of a large staff.

The appointment is superannuable and the salary will be in accordance with Grade 6, Class C of the National Joint Managerial and Higher Executive Grades Agreement (£2,160-£2,360).

Apply to the Manager, Suffolk Sub-Area, Eastern Electricity Board, Finborough Hall, Stowmarket, Suffolk, by 24th June, 1960.

4816

ATLAS LIGHTING LTD.

Lamp Development Laboratory

require

TECHNICIANS AND ENGINEERS

Design experience of incandescent or other lamps and equipment desirable.

Write giving full details to WJM/DEV, Atlas Lighting Ltd., Angel Factory Colony, Edmonton, London, N.18.

4786

AIR MINISTRY

- (a) Station Engineers (General Duties)
- (b) Station Engineers (Mechanical)
- (c) Clerks of Works (Building)

PENSIONABLE posts (40 for (a), 10 for (b), 20 for (c)) for men at least 25 and under 40 on 1st March, 1960 (with extension for Regular Forces service and Overseas Civil Service) with appropriate O.N.C. or equivalent technical qualification.

For (a) and (b) comprehensive engineering apprenticeship followed by at least 3 years' experience in an electrical or mechanical engineering firm, preferably on operation and maintenance work, is essential. Supervisory experience and (for (a)) knowledge of heating and ventilating plant and diesel engines an advantage.

For (c) apprenticeship, training in a building school, experience as journeyman in a building trade, or at least 3 years' experience in estimating, costing and management in a builder's general office is essential, followed by further appropriate experience including at least 3 years as foreman or clerk of works. Ex-R.A.F. Clerks of Works or Station Engineers who do not possess these qualifications may be considered if they have at least 3 years' relevant experience.

Starting salary (national rate) £670 at 25 to £750 at 28 or over. Scale maximum £875. Scale under review. Promotion prospects.

Write Civil Service Commission, 17, North Audley Street, London, W.1, for application form, quoting S/5145/60. Closing date 7th July, 1960.

4819

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

Third Assistant Engineer, Mechanical

APPLICATIONS are invited for the post of THIRD ASSISTANT ENGINEER (Mechanical) in the Midlands Project Group at Bourneville, Birmingham.

Applicants should have a sound technical and practical training in mechanical engineering together with experience in the design and construction of power station mechanical plant. A basic knowledge of power station plant layout is essential.

Duties involve the preparation of plant design schemes and specifications; examination of plant tenders and the handling of contract correspondence.

Applicants should have at least a Higher National Certificate in Mechanical Engineering, and preferably be Graduate Members of the Institution of Mechanical Engineers.

The salary for the post will be in accordance with Schedule C, Grade 5 (£1,090-£1,300 per annum) of the National Joint Board Agreement.

Application should be made on form AE6, available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham, and should be returned to him not later than 22nd June, 1960.

Envelopes should be marked "Confidential Staff Vacancy Notice No. MPG.41/60." 4780

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

APPLICATIONS are invited for the superannuable appointment of ENGINEERING DRAUGHTSMAN at the Central Workshops, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwickshire.

Applicants should be accustomed to general engineering workshop practice and preparing estimates and quotations for the manufacture and repair of all types of power station equipment, under supervision of an engineer.

The successful applicant will also be required to assist in planning and progressing jobs through the workshops and should have served an apprenticeship in mechanical engineering. The possession of a technical qualification will be an advantage.

Salary in accordance with Schedule D of the N.J.B. Agreement, Grade 5, £790-£890 per annum, or Grade 4, £930-£1,030 per annum.

Applications, quoting Vacancy No. 132/60MD, on forms AE6, which are available from D. Cracknell, Manager, at the above address, should be completed and returned by 20th June, 1960.

4805

A TECHNICAL WRITER

is required by

W. H. ALLEN SONS & CO. LTD.

for the preparation and editing of Working Instructions Books for steam turbines, pumps, diesels and electrical machinery.

Applicants should hold or be studying to obtain a Higher National Certificate (or equivalent), and have the ability to express themselves clearly and concisely.

The company offers interesting work, excellent conditions of service and comprehensive recreational and welfare amenities. There is a contributory pension and life assurance scheme in operation.

Applications, which will be treated in confidence, should be made in writing, quoting Ref. No. 1701/5, to:—

THE PERSONNEL MANAGER QUEENS ENGINEERING WORKS BEDFORD

4776

Situations Vacant (continued)**COUNTY BOROUGH OF GRIMSBY****Borough Engineer and Surveyor's Department****Appointment of Public Lighting Superintendent**

THE Highways and Public Works Committee invite applications for the appointment of a PUBLIC LIGHTING SUPERINTENDENT, the salary scale for which will be in accordance with Grade A.P.T. II of the Scheme of Conditions of Service for Local Authorities' Administrative, Professional, Technical and Clerical Services, that is, £705-£880 per annum. The commencing point on the scale to be in accordance with qualifications and experience.

Street lighting is by electricity only, and preference will be given to candidates who are Members of the Public Lighting Engineers' Association and/or the Illuminating Engineering Society.

The appointment will be subject to the provisions of the Local Government Superannuation Acts and to one month's notice on either side, whilst the successful candidate will be required to pass a medical examination.

Form of application and particulars of duties can be obtained from the undersigned, to whom the completed application should be forwarded, accompanied by copies of two recent testimonials, so as to reach this office not later than 10 a.m. on Saturday, 18th June, 1960.

J. V. OLDFIELD, M.Inst.C.E.,
Borough Engineer & Surveyor.

Municipal Offices,
Town Hall Square,
Grimsby. 4708

EAST MIDLANDS ELECTRICITY BOARD**Northamptonshire Sub-Area**

Third Assistant District Engineer:
Kettering District
(Vacancy No. 44/60)

APPLICATIONS are invited from suitably qualified and experienced persons for the above position.

Salary N.J.B. Class G, Grade 9, £860 x £15 to £905 per annum.

Candidates should have had practical experience of the operation and maintenance of urban and rural distribution systems.

A technical qualification equivalent to the Higher National Certificate in Electrical Engineering would be an advantage.

The successful candidate will be required to undertake standby duty and to reside within the District.

Applications should be addressed to the Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton. 4801



A NEW Group is being formed which will create senior vacancies at Departmental Manager level in the following categories:-

- A. CABLE MANUFACTURE.
- B. FOOD PROCESSING.
- C. PHARMACY.
- D. CHEMICAL ENGINEERING.

Applicants must have an appropriate professional qualification, have specialised in one of the above, and be interested in the possibility of the introduction of new products to their field; they should be over 30 and have had some experience in controlling technique.

Please write, in confidence, to:-

Personnel Manager (Ref. 238)

**ELLIOTT BROTHERS
(LONDON) LTD.**

Elstree Way, Borehamwood, Herts

4709

**ATOMIC POWER CONSTRUCTIONS LIMITED**

require

SENIOR ELECTRICAL DRAUGHTSMEN

OPPORTUNITIES have arisen for SENIOR DRAUGHTSMEN who are interested in entering the field of Nuclear Energy and wish to take part in the electrical design of nuclear power stations.

Positions are vacant for men experienced in the following:-

PLANT LAYOUT.
CABLE SYSTEM DESIGN AND INSTALLATIONS.
CONTROL SYSTEMS AND DIAGRAMS.

The work is interesting and varied and good salaries will be paid to the right men. Applications giving full details of age, qualifications, experience, etc., should be sent to:

The Personnel Manager (Ref. E/111)

ATOMIC POWER CONSTRUCTIONS LIMITED

P.O. Box 90
28, Theobalds Road, London, W.C.1

4771

CENTRAL ELECTRICITY GENERATING BOARD**South Wales Division**

APPLICATIONS invited for the following superannuable N.J.B. appointments at USKMOUGH "B" POWER STATION, Nr. NEWPORT, MON.

ASSISTANT ENGINEER (Efficiency)
(Vacancy No. 151/ER/60).
Salary K.7, £1,195-£1,270 per annum.

PLANNING ENGINEER
(Vacancy No. 152/ER/60).
Salary K.7, £1,195-£1,270 per annum.

ASSISTANT ENGINEER (Instruments)
(Vacancy No. 153/ER/60).
Salary K.8, £1,095-£1,170 per annum.

ASSISTANT MAINTENANCE ENGINEER (Mechanical)
(Vacancy No. 154/ER/60).
Salary K.8, £1,095-£1,170 per annum.

Applicants should possess H.N.C. or equivalent qualifications, and have had experience in a modern power station.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 24th June, 1960. 4814

UNITED KINGDOM ATOMIC ENERGY AUTHORITY

require a

MECHANICAL ENGINEER

AT CHAPELCROSS NUCLEAR POWER STATION, NEAR ANNAN, DUMFRIESSHIRE

to supervise the maintenance of heavy and medium mechanical plant including large blowers, turbines and auxiliaries. Candidates may also be called upon to supervise small construction projects either by direct labour or by contract.

Applicants must have served a recognised engineering apprenticeship and be Corporate Members of the Institution of Mechanical Engineers, or have equivalent qualifications. Wide experience of the construction and maintenance of heavy engineering plant in a large works or a power station is essential.

Salary between £1,370-£1,825 per annum according to qualifications and experience.

Contributory superannuation. Staff housing scheme. Generous holidays.

Send POSTCARD to Personnel Manager for application form, quoting reference G.48/57.

Closing date 27th June, 1960. 4782

ESTIMATOR

ESTIMATOR required to prepare tenders for special types of motors and generators. Willing to train engineer with reasonable electrical knowledge. Near S.E. London. Attractive salary, superannuation.

Apply Works Director, E.D.C.C., St. Mary Cray, Kent. 4679

CENTRAL ELECTRICITY GENERATING BOARD**North Eastern and Yorkshire Region**

Fourth Assistant Engineer,
Steam Testing Department

APPLICATIONS are invited for the appointment of a FOURTH ASSISTANT ENGINEER in the Steam Testing Department of the North Eastern Division, Dunston-on-Tyne.

Preference will be given to candidates holding a Higher National Certificate in Mechanical or Electrical Engineering, and a genuine interest in the efficiency aspect of power station plant operation is called for.

Good prospects exist for advancement in this field.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule B, Grade 8 (£735-£935 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from any office of the Board or from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than the 21st June, 1960. 4781

ASSISTANT TO THE MANAGER OF PLANT PRODUCING SINTERED PERMANENT MAGNETS

Age Group 20-24 Years

APPLICANTS should have obtained Higher National Certificate and should preferably have had some factory or laboratory experience in electronics or light electrical engineering.

Superannuation scheme; 5-day week.

Applications giving full details to Staff Dept.,

MUREX LIMITED

Rainham, Essex

4825

SENIOR ELECTRICAL DRAUGHTSMEN

required

with experience of distribution, power and lighting schemes, diagrams, control gear, cabling and D.O. routine.

O.N.C. preferable but not essential. Evidence of training and ability required.

Full details of age, training, experience and any qualifications should be sent to Chief Electrical Engineer, Dorman Long (Steel) Ltd., C.E. and P.C.D., G.P.O. Box 11, Royal Exchange, Middlesbrough.

4774

THE MORGAN CRUCIBLE Company Limited require, at their Norton Works, an

ELECTRICAL ENGINEER

for interesting work, connected with the manufacture of ceramic resistors, having applications ranging from radio to power transmission.

In addition to H.N.C., Degree or Graduate I.E.E., a wide interest in electrical engineering and some practical experience is necessary.

A knowledge of surge generators, impulse testing, transient measurements or power transmission equipment would be an advantage.

A good salary is offered to a young man, aged 22-30 years, seeking early recognition of his technical ability and sense of responsibility.

Good conditions of employment include a superannuation scheme.

Apply to Staff Department, The Morgan Crucible Company Limited, Norton Works, Woodbury Lane, Norton, Worcester.

4777

SURREY EDUCATION COMMITTEE

Kingston Technical College, Fassett Road, Kingston-upon-Thames Department of Electrical Engineering

SENIOR LECTURER or LECTURER, depending upon qualifications and experience, required for 1st September, 1960, or as soon thereafter as possible.

Applicants should possess a degree in electrical engineering and appropriate professional qualifications, together with teaching and industrial or research experience. The department requires for this post a person who is prepared to teach in a wide range of electrical engineering subjects to Final Year Degree and Higher National Diploma level.

Salary scales for the above posts in accordance with the Burnham Technical Report, 1959, plus London allowance:-

Senior Lecturer, £1,550 x £50 to £1,750.

Lecturer, £1,370 x £35 (£40) to £1,550.

Further particulars for each post and application form from the Principal on receipt of stamped addressed envelope.

4806

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE Burton Street, Nottingham

Principal:
D. A. R. Clark, M.Sc.(Tech.), M.I.Mech.E.

A PPLICATIONS are invited for the following vacancies:-

LECTURERS:

- (a) Light Current Electrical Engineering.
- (b) Electrical Engineering, to specialise in Utilisation of Electrical Plant and Machines.

SALARY in accordance with the Burnham Technical Scale as follows: £1,370 x £35 to £1,550 per annum.

A salary above the minimum will be paid in approved cases.

Research encouraged. Facilities and equipment available.

Further particulars and form of application may be obtained from the Principal, to whom completed forms should be returned not later than 24th June, 1960.

4832

**DOWDING & MILLS LTD.
Bordesley, Birmingham, 12**

the industrial electrical and mechanical repair specialists, seek the services of an **ENGINEER REPRESENTATIVE TO OPERATE FROM THEIR NEW BRANCH AT SOUTHAMPTON.**

Experience of electric motor manufacture and repair desirable, together with a knowledge of metal spraying.

Basic salary, bonus, superannuation scheme, and company car provided.

Applications to the Southern Area Sales Manager, Dowding & Mills Ltd., 24/26, White Post Lane, London, E.9.

4732

SOUTH EASTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEER, Dorking and Epsom District.

The appointment will be made at N.J.B. Class F, Grade 5, salary £1,025 x £20 to £1,085, with progression to Grade 4 (maximum salary £1,170) subject to satisfactory service. Superannuable.

Applicants should preferably be Corporate Members of the I.E.E. They should have had responsible experience in planning, construction, operation and maintenance of both underground and overhead systems up to 33 kV in urban and rural areas. The ability to control staff and organise work is essential.

Applications, quoting ER, and naming two referees, on forms from District Manager, SEEBOARD, 56, South Street, Dorking, by 22nd June, 1960.

GEORGE WRAY,
Secretary. 4800

Circuit Design Draughtsmen

MEN who have had experience in the design or manufacture of high-voltage switchgear and who have qualifications to at least O.N.C. standard are invited to apply for the above vacancies.

Salaries paid will be above A.E.S.D. rates and for men with the right experience will be in the region of £1,100 p.a.

Write stating age and experience to

MACGREGOR BEAN & CO. LTD.

2a, Cambridge Grove Road
Kingston-on-Thames, Surrey

4695

ELECTRIC MOTOR CONTROL

ENGINEERS required by West Midlands manufacturers for their
APPLICATION ENGINEERING DEPARTMENT
at their main works.

Removal expenses met in approved cases.
Write Box No. 4731, giving age, experience and salary required.

THE HARLAND ENGINEERING COMPANY LTD., ALLOA

require several

SENIOR DRAUGHTSMEN

in connection with an expanding development programme in the field of centrifugal pumps, hydraulic turbines and medium/large electrical rotating machinery.

Experience in these products, whilst advantageous, is less important than thorough knowledge of modern mechanical engineering, stress analysis, materials selection and application, and up-to-date draughting methods.

The company offers good salaries and working conditions with contributory pension scheme, extended holidays after twelve months. A company house is available or assistance with house acquisition or purchase can be provided.

Replies giving full particulars of age, qualifications and experience will be treated in strict confidence and should be sent marked "Personal" to Chief Draughtsman, B.E.P. Works, Alloa, Scotland.

308

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

A SSISTANT CONSUMERS' ENGINEER (Development). The successful applicant will be required to visit and advise architects, builders, industrialists and consumers in the furtherance of electrical load development.

Preference will be given to engineers with appropriate technical qualifications who have had experience in the design of electrical space heating installations and in the organisation of exhibitions and lectures associated with load development projects.

Salary N.J.B. Class H, Grade 10, £860/£15 £905 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 24th June, 1960.

4821

SOUTH WALES ELECTRICITY BOARD

Third Assistant District Commercial Engineer

A PPLICATIONS are invited for the position of **THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER** in the Cardiff District of the Cardiff and East Central Area of the Board.

Preference will be given to Engineers possessing H.N.C. in Electrical Engineering and who have had experience of engineering and commercial problems of supplies to large and small commercial and industrial consumers.

The salary for the position will be in accordance with Class J, Grade 9 (£965/£1,025) of the National Joint Board Schedule for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to C. L. Townsend, Assoc. I.E.E., Manager, Cardiff and East Central Area, 445/447, Cowbridge Road East, Cardiff, to arrive not later than 27th June, 1960.

Envelopes should be endorsed "Third Assistant D.C.E. SV.117/60."

4773

THE STEEL COMPANY OF WALES LTD.

Velindre Works, Morriston, Swansea

A PPLICATIONS are invited for the following appointment in the Electrical Engineering Department of a modern tinplate works.

JUNIOR ELECTRICAL ENGINEER. A graduate, aged not more than 28, is required for this post. Suitable training will be provided, but a knowledge of steelworks control systems would be an advantage. This industry offers considerable scope for men of the required calibre. A contributory pension scheme is available.

Applications stating age, experience and qualifications should be sent, not later than 20th June, to:-

The Chief Electrical Engineer
THE STEEL COMPANY OF WALES LTD.
Velindre Works, Morriston, Swansea

4755

ELECTRICAL CONTRACTORS

have the following vacancies
in their Manchester Office:

(a) **SENIOR DESIGN ENGINEER** capable of working without supervision and having a wide experience in the design of lighting and power installations, control and instrumentation cabling on large industrial and commercial projects.

(b) **ESTIMATING ENGINEERS** of proved ability in the preparation of detailed estimates for all classes of installation and cabling work, both in this country and overseas.

Applications in own handwriting, stating age, educational background, qualifications, experience and salary required to:-

The Manager
DRAKE & GORHAM (CONTRACTORS) LTD.

21, Newton Street, Manchester, 1

4756

Situations Vacant (continued)

INSTRUMENT TRANSFORMER DESIGNER

required by

SMITH HOBSON LTD.

Write stating age, experience and salary required to

Chief Designer
SMITH HOBSON LTD.
Walton-on-Thames

4787

DRAUGHTSMEN REQUIRED BY LIGHTING EQUIPMENT MANUFACTURER

A GOOD opportunity for young draughtsmen arises in the London office of a well-known and established manufacturer of a variety of specialised lighting fittings. Some works experience or training preferred.

Convenient to Victoria and Waterloo stations. 5-day week, contributory pension scheme.

Write fully to—Box 4753.

A SSISTANT electrical engineer required by national newspaper. Age 25/26. Electrical apprenticeship and Higher National. Must be first-class electrical draughtsman. Good prospects.—Box 4696.

A SSISTANT supervisor with estimating experience required by electrical contractor. Apply in writing stating experience, salary required, etc., to—Waring, Withers & Chadwick Ltd., 40, Hatton Garden, London, E.C.1. 4575

B RITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., Longridge House, Manchester, 4. Electrical surveyors required in Ireland and Scotland. Permanent positions carrying progressive salary scale £800 to £1,100 and non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. 4812

B RYCE ELECTRIC CONSTRUCTION Co. Ltd. have vacancies for senior and junior power capacitor and transformer development engineers. Write Chief Engineer, Bryce Electric Construction Co. Ltd., Kelvin Works, Hackbridge, Surrey, stating age, experience, qualifications, and salary required. 4321

C ONTROL circuit engineer and estimator for automatic motor control gear; O.N.C. or H.N.C. desirable with previous experience; permanent and pensionable situation. Apply giving details of age, experience and present salary, to—The Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 129

D RAUGHTSMAN (junior) electro/mechanical; interesting situation with excellent prospects. Apply giving full details of age, experience and present salary, to—The Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 130

D RAUGHTSMAN layout. Over 21 years. 5-day week. Pension scheme. A.E.S.D. rates.—Auto Diesel Ltd., Uxbridge (Tel. Uxbridge 81).

E LECTRICAL contractor for industrial and commercial installations. Only fully experienced men who are conversant with all types of work will apply. Please write stating experience, qualifications and salary required to—

E LECTRICAL design engineer to work with minimum supervision on estimating power and lighting services on building projects. H.N.C. level of ability required. Apply in writing giving full details of age, experience and salary required to—Norman & Dawbarn, Architects & Consulting Engineers, 7, Portland Place, London, W.1. 131

E LECTRICAL draughtsman required with H.N.C. or equivalent. Knowledge of factory installation work desirable. Non-contributory pension scheme. Excellent canteen facilities. Food factory in London area. State experience and salary required.—Box 4788.

E LECTRICAL engineer required for Glasgow office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler & Electrical Insurance Co. Ltd., 98, West George Street, Glasgow, C.2. 4813

E LECTRICAL engineer with wide experience of estimating for large industrial and commercial installations. Apply in writing giving age, experience and qualifications to—W. J. Furse & Co. (Manchester) Ltd., 20, Mount Street, Manchester, 2. 4829

E LECTRICAL engineer-surveyor for routine inspection of all types of electrical plant installed in a large group of engineering factories. All applicants should have had extensive experience with this type of plant and good theoretical knowledge. Pension scheme. Apply stating age, experience, qualifications and salary required to Personnel Manager, T.I. (Group Services) Limited, Rocky Lane, Aston, Birmingham, 6. 4828

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E NGINEER required with experience of development or testing of house service electricity meters. Higher National Certificate preferred.—Box 7551.

E STABLISHED electrical engineering concern engaged in manufacturing and repair of electric motors and transformers require qualified electrical engineers for staff appointments in United Kingdom. Age limit 37. Good conditions. Applications stating training, qualifications, experience, present position to—Box 4757.

R EPAIR shop motor winder, A.C. and D.C., good general knowledge of the trade also required. Excellent prospects in small, well-established business, 25 miles west of London.—Box 4577.

R EPRESENTATIVE required to call on electrical contractors and industrial users in Western areas of London and Middlesex. Experience essential. Car allowance.—Box 4826.

R EPRESENTATIVES required calling on wholesalers and retailers for most competitive distributors in the trade. Accessories, lamps, fittings and appliances. Only top-rate men with electrical trade connections need apply.—Universal Distributing Co. Ltd., 66/68, Great Eastern Street, London, E.C.2 (Phone, SHOre-ditch 8282). 4415

S ALES engineers. Young engineers over 21 years required for indoor staff of sales department. Technical and works training in electrical engineering practice, at least to O.N.C. standard, is required by West London engineering company specialising in explosion-proof and industrial electrical control gear as well as other electrical equipment for industry. Candidates, in replying, should state age, training, qualifications and anticipated remuneration, in confidence, to—Box 182.

S ALES representative required for head office, London, by well-established manufacturers of duct systems for electrical services. Knowledge of building and electrical trades essential. Splendid prospects with a progressive company.—Box 4810.

S ALESMAN required for London and Home Counties with wholesale connection in the electrical industry. Holiday arrangements offered. Apply stating age and salary required to—Armorduct Cable Co. Ltd., 1/3, 1/3, Road, London, S.W.9. 4789

S JUNIOR and junior electrical design engineers/draughtsmen required for consulting office. 5-day week, luncheon vouchers, spring and summer holidays. Applicants for senior posts must be experienced in design of electrical services for modern hospitals, universities, factories, etc. Please apply stating age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.1. 131

S ENIOR electrical engineer of graduate or Higher National Certificate standard required for development and design of small electric motors. Some previous experience an advantage. This appointment is at a new factory in Bothwell, Lanarkshire, in pleasant surroundings. Please apply to—Ref. JM/102, The Belmos Company Limited, Bellshill, Lanarkshire, Scotland. 4790

S ENIOR electrician for first-class electrical installation work required by well-known concern. Two years overseas. Good opportunity. Write age, experience, copy references.—Box 4809.

S PECIFICATION writer/engineer. A vacancy exists with Sangamo Weston Ltd. at Enfield for a young man having a light electrical engineering background and educated to H.N.C. (Electrical) standard. Work entails preparation of specifications of electrical measuring instruments to meet customers' requirements and liaison between development laboratories and contracts department. Write giving full particulars of experience, etc., to the Personnel Manager, Sangamo Weston Ltd., Cambridge Road, Enfield, Middx. 4616

S TOREKEEPER required, only first-class applicants with substantial experience in electrical wholesaling will be considered. More than average salary is offered in return for ability and efficiency. Permanent superannuated post for right man desirous of progress. Canteen available.—Halsey's, Fulham 3355. 156

S TORES assistant (junior) required by electrical wholesalers. Opportunity to learn trade. Good prospects. Apply—Supra Elec. Co. Ltd., 26, Soho Square, London, W.1. 4827

SUPERVISING engineer. Must be experienced estimator in all types of commercial and industrial electrical installations. Write full details of training and experience to the Manager, F. H. Wheeler & Co. Ltd., 52, Elswick Road, Newcastle upon Tyne, 4. 7550

S UPERVISOR. Established electrical contractors N.W. London require supervisor capable of estimating for and carrying through contracts for industrial and public authority work. Contributory pension scheme.—Box 4625.

T ECHNICAL assistants required for firm of scientific instrument makers for testing, installations and service of prototype electronic equipment. Applicants should have had at least three years' industrial experience. H.N.C. Electrical is desirable but not essential. The position offers opportunities to travel widely. Please write, quoting ref. E.82, to the Personnel Officer, Hilger & Watts Limited, 98, St. Pancras Way, London, N.W.1. 4807

T RANSFORMER representative for the electronic and industrial transformer fields. Preference will be given to a person already engaged in a similar capacity. Salary plus commission. Car will be supplied.—Willesden Transformer Co. Ltd., Manor Park Road, London, N.W.10 (Elgar 5445). 310

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A RE you seeking a first-class salesman, or agent of many years' experience? Strong connections with wholesalers, boards, in London and Home Counties, also West Country.—Box 7544.

E LECTRICAL-mechanical engineer with many years' experience on large power stations and systems, specially hydro-electric. Specialist on construction, maintenance and preventative maintenance. Seeks further employment anywhere. Recently six years in India. Good references.—Box 7548.

E XPERIENCED young man seeks position with sound prospects as manufacturers' representative. Specialities moulded circuit-breakers and switchgear. Conversant with all aspects of the industry.—Box 7545.

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4791

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Best offer required.

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4583

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motors, switchgear, exhaust fans, hoists,
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Marine, Cornish vertical, etc.—Burford, Taylor
& Co. Ltd., Boiler Specialists, Burtyaco House,
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A.C. and D.C. 1/- slotmeters. Guaranteed 2
years, 2½-50 amps. From 55/- Repairs
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ALTERNATORS and generators, all types
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ALTERNATORS, 3-phase, all sizes in stock
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Manufacturing Co. Ltd., 20/26, Britannia Walk,
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BARGAINS in electric motors from A. Cooks-
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BILLIARD Meters. 1/-, 6d. or 1d. slot.
All time settings. From 170/-. See
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CABLE, underground, PILC/VIR/LC, ex
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GENERATING sets, portable or stationary,
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D.C. See Television.—Tradex, Surbiton. 171

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Details from : Tradex Meter Co., Surbiton
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2-speed motor, 40/20 h.p., 950/480 r.p.m.,
T.E.F.C. slipping type by L.D.C. with Igranic
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180-h.p., 970-r.p.m. T.E.F.C. slipping
motor by Lancashire, 400 v., 3-phase,
50 cycles, complete with fully automatic starting
panel. Further details from—Dynamo & Motor
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300-kW mercury arc rectifier, input 6,600
volts, output 500 volts, 600 amps.,
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500/625-kW L.D.C. generator, 240 volts,
2,080/2,600 amps., D.C., compound
interpole with single bearing for direct coupling
at 1,000 r.p.m., or on combination bed with
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in approximately six months. Also duplicate
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500-kW, 220-volt Met.-Vick. rotary converter, with transformer, 11,000 volts, 3-phase, 50 cycles, and accessories.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.R. 17

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GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service.—Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

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D.C./A.C. Motors, Transformers, Cables and all redundant Power Station Plant wanted for dismantling.

ASK US TO QUOTE

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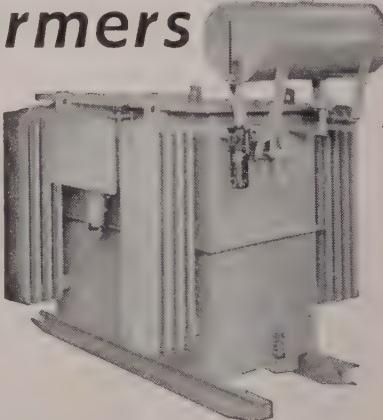
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COMPANY MEETINGS

DAVIS AND TIMMINS, LIMITED

Year of Substantial Progress in all Departments

Mr. F. LE NEVE FOSTER ON RECORD GROUP SALES

THE 61st Annual General Meeting of Davis and Timmins Limited was held on 3rd June in London.

Mr. F. Le Neve Foster (the Chairman) presided, and, in the course of his speech, said:—

The results which I have to place before you today again show a considerable improvement on those for the previous year. As shown by the Consolidated Profit and Loss Account, the Group Profit for the year before taxation, but after charging depreciation, directors' emoluments and interest on unsecured loan stock, is £252,724 as compared with £198,398, while the net profit after taxation amounts to £135,586 as compared with £106,071 for the previous year.

These gratifying figures are mainly attributable to the increased production and sales turnover which has been achieved. Group sales for the year, both in volume and weight, are a record in the history of the company and show an increase over those for the previous year of the order of 25%. I would, however, emphasise that this increase does not to any marked degree reflect better prices, as competition remained very keen, in spite of the fact that, following the upward trend of trade generally, demand for our products became much brisker during the latter part of the year. The greatest credit is due to the management, both on the sales and production sides, for this result.

I am satisfied that 1959 has been a year of substantial progress in all departments which augurs well for the future.

DIVIDENDS AND APPROPRIATIONS

The Directors recommend a final dividend of 17½% making, with the interim dividend of 7½% already paid, a total of 25% for the year on the Issued Ordinary Capital as against 20% for the previous year.

FINANCIAL POSITION

Turning to the Balance Sheet perhaps the most noteworthy feature is the realisation of part (5/6ths) of our Trade investment for the sum of £224,607 net which resulted in a cash profit against cost of £144,919 which has been carried to Revenue Reserves.

The substantial figure of cash produced by this sale without recourse to the shareholders will, however, prove most useful in furthering the future development and expansion of the business.

With this addition to our Reserves, the total of our capital and Revenue Reserves (exclusive of the Reserve for future Income Tax) amounts to the substantial sum of £831,385 as against the amount of the issued Ordinary Share Capital of £442,500. In view of the strength of the position thus shown, the Board has considered that the time is opportune to recommend the capitalisation of £110,625 of the Reserves to

provide for distribution to the Ordinary Shareholders of one fully paid new Ordinary Share for every four ordinary shares held.

Group net current assets, less liabilities and provisions, show a very satisfactory increase of £267,140 during the year.

PRODUCTION

Throughout the year we have continued and intensified our various measures for reorganising and improving the efficiency of our factories.

In accordance with our programme for modernising the layout of our factories to meet present-day requirements, the Wood Green Works, which is engaged in the manufacture of standard products, has been completely re-planned and its machines re-grouped.

By these means and by continuing our programme of replacing uneconomic plant with new machines, many of our own design, good progress has been made in raising the output from our factories with reduction of machining and handling costs—a process which continues in the current year. This year our production is being maintained at a very high level, and to meet customers' requirements a large proportion of the plant is being operated on a two-shift basis.

SALES

Our company has made great progress in its endeavours to meet the pressures of modern conditions so that today it can face effectively the never-ceasing prodding of competition, and at the same time provide the service to customers which we regard as so important.

Many factors have contributed towards the realisation of these aims, but not least—and certainly the most effective—has been the development of the sales and distribution side of our business which, in my opinion, cannot be equalled in our trade.

We have, today, a powerful and well-trained sales force. In the past year it has acquitted itself well in the drive to extend our markets and this year it continues to produce excellent results. Our sales force is supported by well-equipped and well-stocked depots capable of supplying at very short notice the immediate needs of industry anywhere in the United Kingdom.

We have continued to give particular attention to the question of extending the range of our products, saleable to customers within the compass of our selling organisation. During 1959 considerable progress was achieved in marketing well-known products, for which we have the sole selling rights, and during the current year our sales of these items have already reached new record levels.

We shall take every opportunity of exploiting our success by every means possible, including the extension of our distribution network with

the object of improving still further our customer service.

SUBSIDIARY COMPANIES

For the current year Datim Machine Tool Co. Ltd. has secured a reasonable order book covering a wide range of special-purpose machinery and attachments from a diversity of industry, and I have no doubt it will add to its already high reputation in the machine tool industry.

We acquired, at the beginning of the year, a new subsidiary, Wade Couplings Limited, which is engaged in the development and sale of pipe unions and couplings.

This has proved to be a very valuable acquisition to the Group both from the point of view of its profit earnings and for the volume of repetition turning work it provides for our machine shops.

To cope with the rapid expansion of this business a new factory at Ilford has been placed at its disposal where large and comprehensive stocks are now available.

The general atmosphere of trade in the current year is far better than when I addressed you at the meeting last year.

The Group sales turnover for the first sixteen weeks of the current year shows an average rate of increase of 30% compared with the average weekly rate over the whole of last year.

These figures are naturally reflected in current profits and, provided no unforeseen circumstances arise, we have every reason to anticipate the results for 1960 will mark a further stage of progress.

Looking further into the future, we shall no doubt encounter vicissitudes of trade but I firmly believe that never before in its long history has our Company been in sounder shape and heart to meet them and to continue to progress. In the steps which have been taken to build to this position and implement the vigorous policy of the Board I must pay great tribute to our Managing Director, Mr. Somerville, who has been tireless and full of resource in his efforts. He has been very ably seconded by my colleagues, Mr. Bannister and Mr. Grubb, on the Engineering and Sales sides respectively. Our Managing Director has gathered round him a fine band of young and energetic executives to whom high praise is also due. Under this able management and with the growing diversification of the products we handle, as well as with the ever-expanding strength of our production and distribution facilities, we have good ground for confidence in the prospects of the Company, for the benefit of customers and shareholders alike.

The report was adopted and, at a subsequent Extraordinary General Meeting, proposals for increasing the capital and a scrip issue were approved.

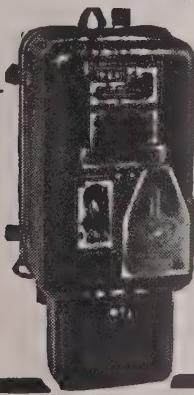
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Aluminium Wire & Cable Co. Ltd.	40	Fuse, W. J., & Co. Ltd.	88	Ormond Eng. Co. Ltd.	84	Stream-Line Filters Ltd.	83
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Asquith Electricals (Coine) Ltd.	91	Gordon Motors	32	Perkins, J. M., & Smith Ltd.	72	Telco Ltd.	112
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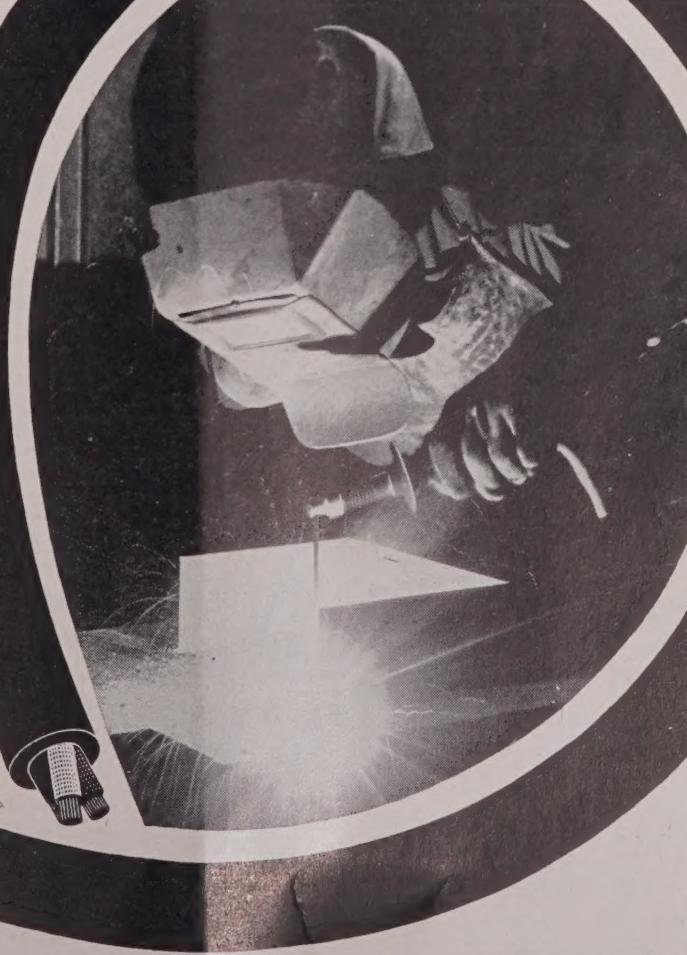
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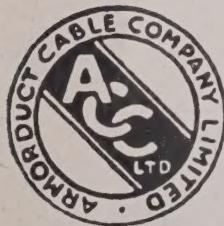
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